

# The George Washington Regional Commission

## 2009 Green Infrastructure and Conservation Corridors Maps



Photo Courtesy of the Fredericksburg Regional Chamber of Commerce



This project was funded, in part, by the Virginia Coastal Zone Management Program at the Department of Environmental Quality through Grant #NA 08NOS4190466 of the U.S. Department of Commerce, National Oceanic and Atmospheric Administration, under the Coastal Zone Management Act of 1972, as amended. Any views expressed herein are those of the author(s) and do not necessarily reflect the views of the U.S. Department of Commerce, NOAA, or any of its subagencies.

## INTRODUCTION

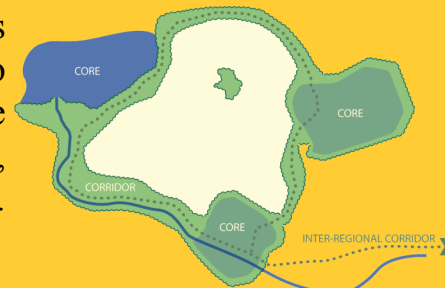
The George Washington Region (Planning District 16) has experienced the most rapid population growth of any region in the Commonwealth for almost two decades. The cumulative result of hundreds of private development actions approved at various levels individually by local governments (in the absence of an overall regional plan to guide local actions) can lead to a regional development pattern with unintended and unforeseen consequences.



## DEFINITION OF GREEN INFRASTRUCTURE

Green Infrastructure is an “interconnected network of natural areas and other open spaces that conserves natural ecosystem values and functions, sustains air and water, and provides a wide array of benefits to people and wildlife.”  
(The Conservation Fund)

Green Infrastructure Planning involves strategically planned and managed networks of natural lands, working landscapes and other open spaces that conserve ecosystem values and functions and provide associated benefits to human populations. The network consists of core habitats connected by corridors that help animals, seeds, and people move across the landscape.  
(Green Infrastructure Center)



Courtesy of the Richmond Regional Planning District Commission

Benefits of Green Infrastructure Planning include

- Combats global warming.
- Improves air quality.
- Protects water resources.
- Provides recreation.
- Provides health benefits.
- Enhances community appearance.
- Provides stormwater management.
- Protects wildlife habitat.

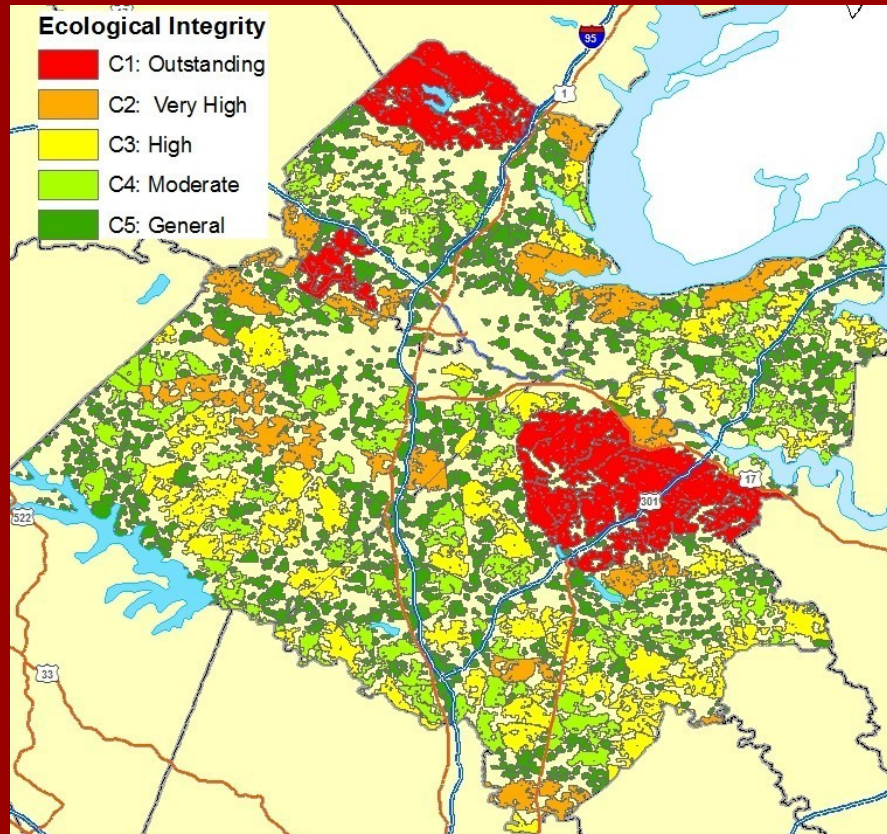
The goal is to make informed land use decisions by maintaining natural landscapes that protect blue and green infrastructure and ensure the health of the community.

## VCLNA OVERVIEW

The Virginia Natural Heritage Program in the Department of Conservation and Recreation (DCR) has developed the Virginia Conservation Lands Needs Assessment (VCLNA) which is an integrated assemblage of geospatial datasets and conservation prioritization guidelines, with the goal of supporting Green Infrastructure planning in the Virginia Coastal Zone as well as better environmental planning in the Commonwealth.

The Ecological Core Model, one of models developed under the VCLNA, used the Virginia Natural Landscape Assessment (VaNLA) which is a model for identifying, prioritizing, and linking natural lands in Virginia. The base satellite imagery used to evaluate natural areas came from the Regional Earth Science Application Center in 2000. These natural lands (cores) were assigned an Ecological Integrity Score based on statistical analyses of 53 geospatial attributes. In general, higher scores were given to areas that are more biologically diverse, part of a larger complex of natural lands, and contribute to water quality enhancement.

The regional ecological core map below demonstrates the distribution of natural lands by ecological integrity across the George Washington Region from the VCLNA model.

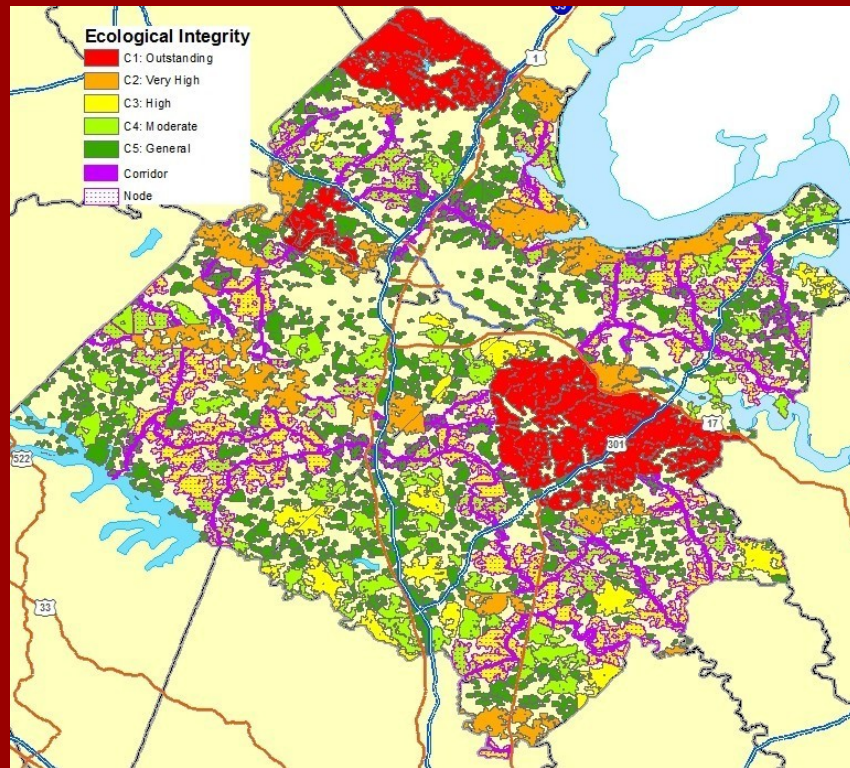




## VCLNA OVERVIEW (continued)

Another model produced by the VCLNA is Landscape Corridors. The corridors are a minimum of 300 meters wide (100 meters of interior cover and 100 meter buffer on either side). Landscape nodes are lower-ranked Ecological Cores and Habitat Fragments that intersect Landscape Corridors.

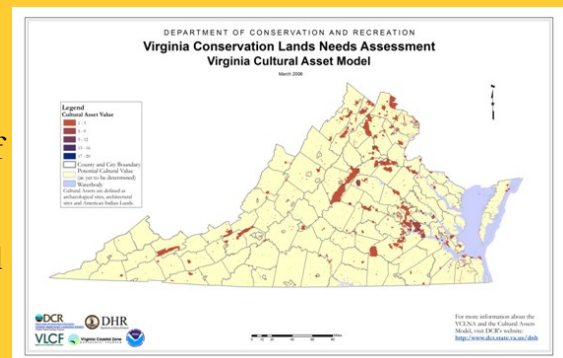
The Regional Corridor and Node Map below establishes regional connectivity between corridors and shows a potential regional network of green infrastructure corridors.



To develop the Cultural Asset Model, DCR coordinated with the Virginia Department of Historic Resources to map sites with historic and cultural significance.

These included:

- Listed National Historic Landmark sites
- Listed Virginia Landmarks Registry sites
- Listed entities listed on the National Register of Historic Places
- Sites under historic preservation easements
- Eligible sites to be listed on the National Register of Historic Places
- American Indian Lands



After meeting with local staff, cultural asset and conserved land maps were created for each locality based on local staff input. These maps can be found in Appendix A.

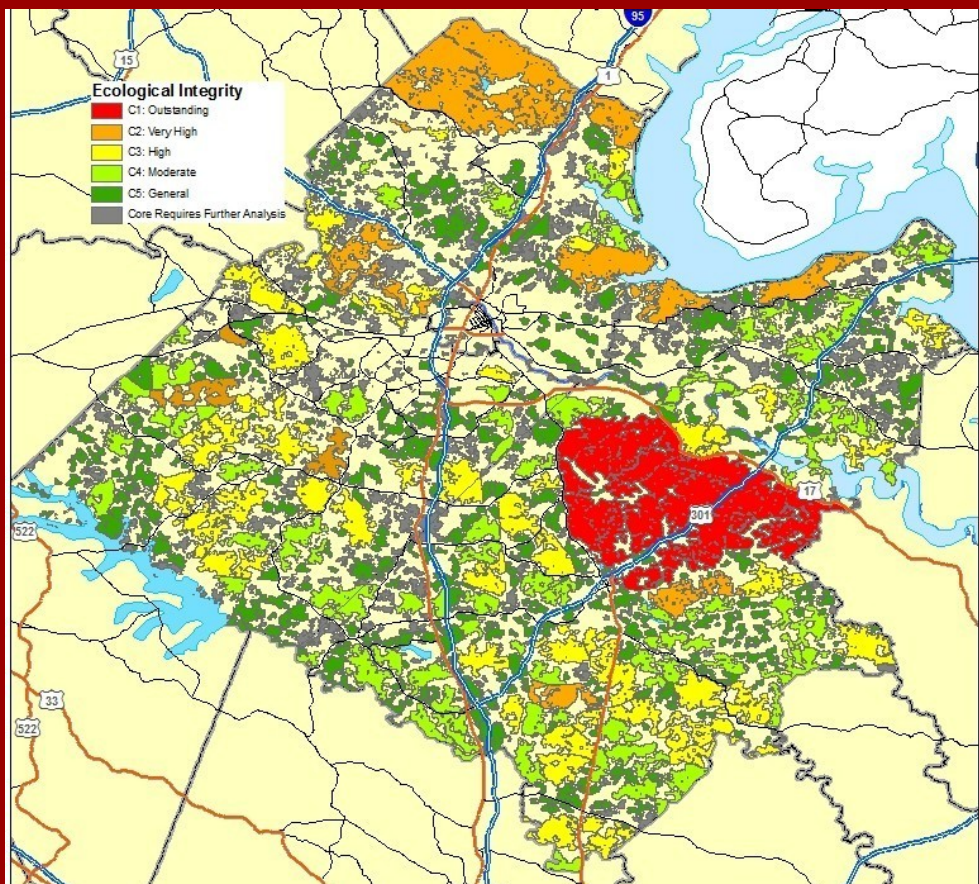


## ECOLOGICAL CORE UPDATE PROCESS

The first map for each locality shows the VCLNA Ecological Core Model with areas ranked from C1 to C5, with C1 representing areas with very high ecological integrity. Cores are at least 100-acres and not fragmented by roads, rail, power lines, etc.

The ecological core model was created by DCR based on 2000 satellite imagery. Because the imagery input is almost a decade old, we updated the model based on the most recent building footprint file for each locality. The ecological impact a building has on the environment is 100 meters (as determined by the scientists who built the first ecological core model). Based on the new building footprints and the 100 meters around each, we removed any areas that encroached on the cores. The area of the remaining cores were recalculated. If the area lost was more than 20%, it moved down a level on the ecological integrity scale. In one decade, the location, abundance, and status of the cores of ecological significance have changed dramatically. Many areas have been fragmented because of development activity.

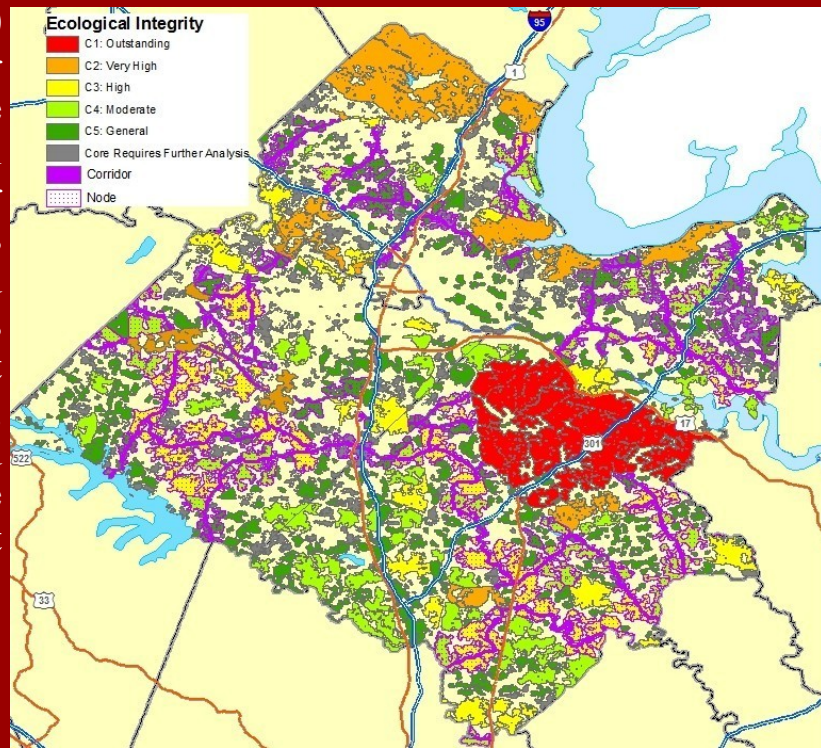
This methodology was developed by the Richmond Regional Planning District Commission in consultation with DCR and the Green Infrastructure Center, and was also followed by the Crater Planning District Commission. By following the same methodology, this gives the state a large green infrastructure picture that crosses not only jurisdictional, but also regional boundaries throughout most of Virginia's Coastal Zone.



After meeting with local staff, ecological core update maps were created for each locality based on local staff input. These maps can be found in Appendix A.

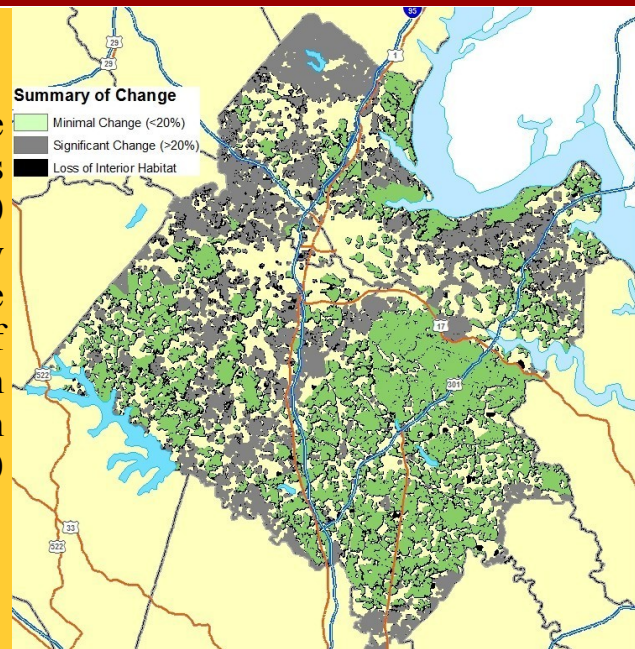
## CORRIDOR AND NODE UPDATE PROCESS

The state created a network of corridors and nodes by connecting ecological cores in the two highest categories (C1 and C2). Corridor routes were modeled by connecting each high priority core and, as much as possible, passed through natural lands and lower-ranked cores. The corridors are at least 300 meters in width (100 meters of interior cover and 100 meters of buffer on either side). After the ecological core model was updated, the corridor and node model was overlaid on the updated model. If corridors moved through areas that lost ecological integrity, corridors were re-routed to travel through the areas of highest ecological integrity.



## SUMMARY OF CHANGE MAP

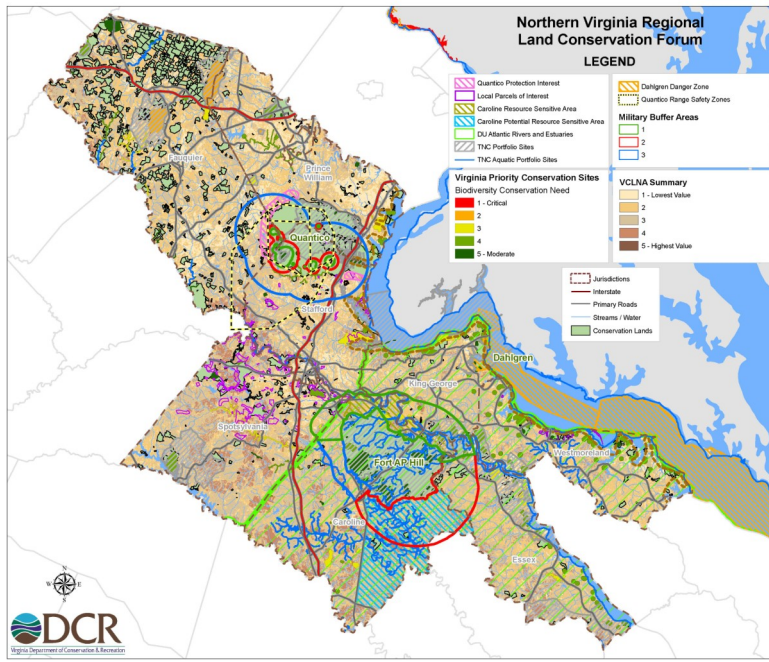
The map at the right summarizes the amount of land in the ecological cores lost since 2000 as a result of the 100 meter ecological buffer around new development. The black areas on the map represent a complete loss of habitat. The gray shows a change in acreage over 20 percent. The green shows a change in acreage less than 20 percent.





## Northern Virginia Land Resources Conservation Forum (NVLRCF) Green Infrastructure Efforts

The Virginia Department of Conservation and Recreation has organized several meetings between county, state, and federal government agencies, non-profit



conservation groups, and other related organizations interested in discussing the programs and resources available to preserve land and natural resources. The group has focused on the east-west corridor of Interstate Highway 64. Beyond providing a forum to exchange information, the NVLRCF initially developed a working green infrastructure map with input from involved stakeholders. To capitalize on existing mapping work, we have used applicable layers as identified on the NVLRCF map.

### GRANT DELIVERABLES

Composite Regional Map showing  
Regional Conservation Corridor  
page 6

Appendix A: Individual draft blue-green infrastructure maps for each community

Caroline County	10
City of Fredericksburg	15
King George County	20
Spotsylvania County	25
Stafford County	30
Metadata	35



Aquia Harbor Marina, Photo Courtesy of the  
Fredericksburg Regional Chamber of Commerce

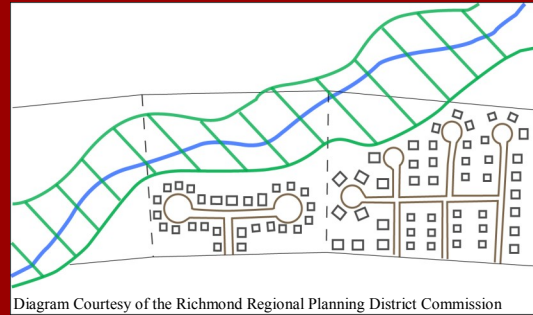
## NEXT STEPS

- Maps can serve as a resource for local planning efforts, including the development of a locality's natural resource or open space conservation plan
- Continue to update as new information becomes available
- Use GIS tools to create an economic value for natural areas
- Educate the public on green infrastructure



### FRAGMENTATION

Poor land use planning can result in fragmentation of a region's natural resources.



### CONNECTIVITY

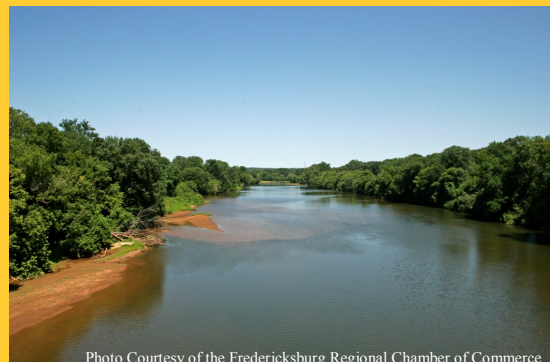
Using green infrastructure to make land use decisions can ensure natural resources stay intact and connected through the use of conservation oriented land use planning techniques.

## ACKNOWLEDGEMENTS

Local government Planning Department and GIS Staff

Staff at Richmond Regional Planning District Commission

Members of the GWRC Green Government Commission Green Earth Sub-Committee, including: Chris and Dick Folger, Doris Whitfield, Grant Woodwell, and Patricia Kurpiel.



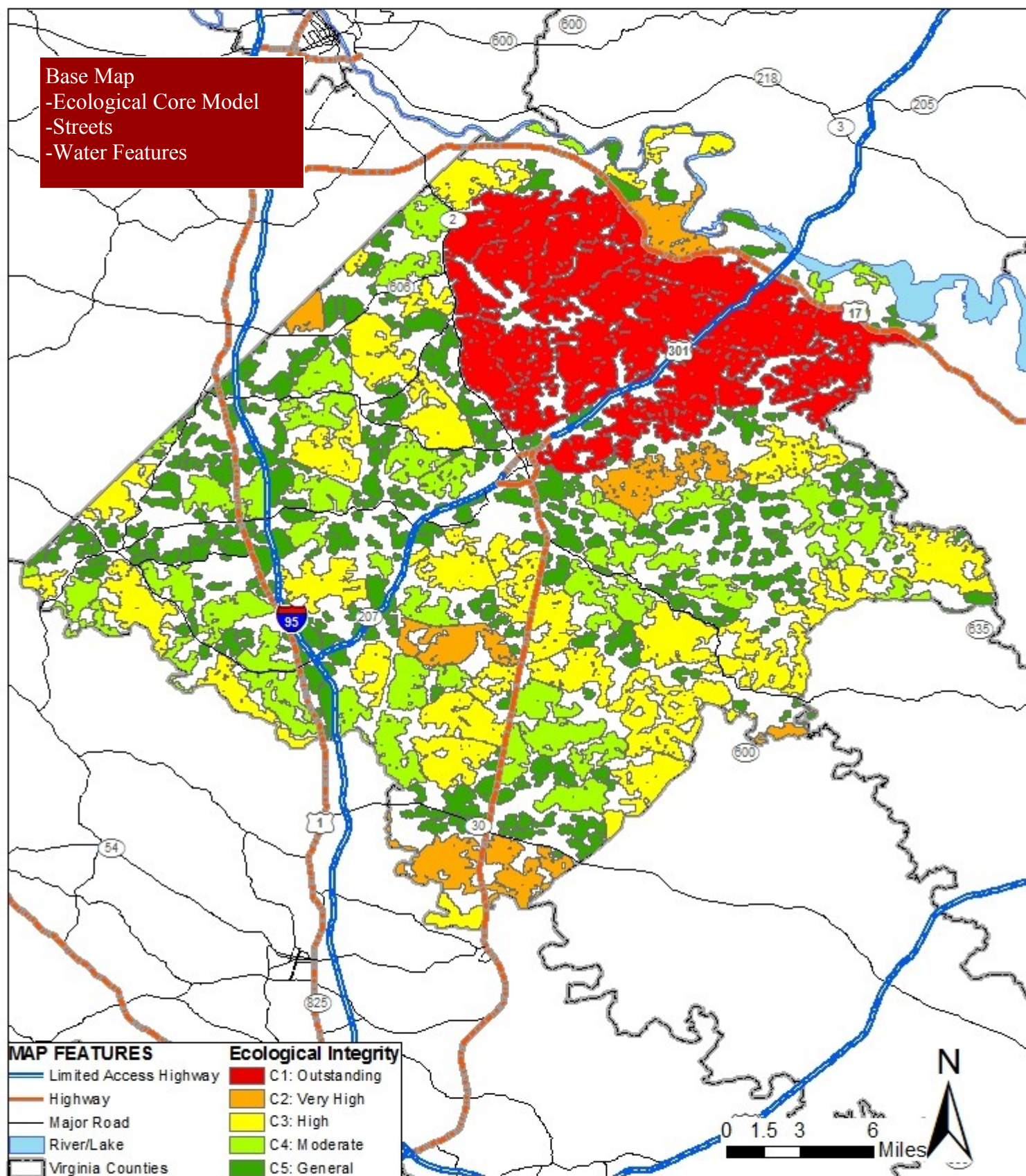


# Appendix A

Individual draft blue-green infrastructure maps for each Community

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City of Fredericksburg	15
King George County	20
Spotsylvania County	25
Stafford County	30

# Caroline County: Ecological Cores



Map created by GWRC staff, August 2009  
 hammig@gwregion.org

Source data supplied on February 26, 2009 by the Virginia  
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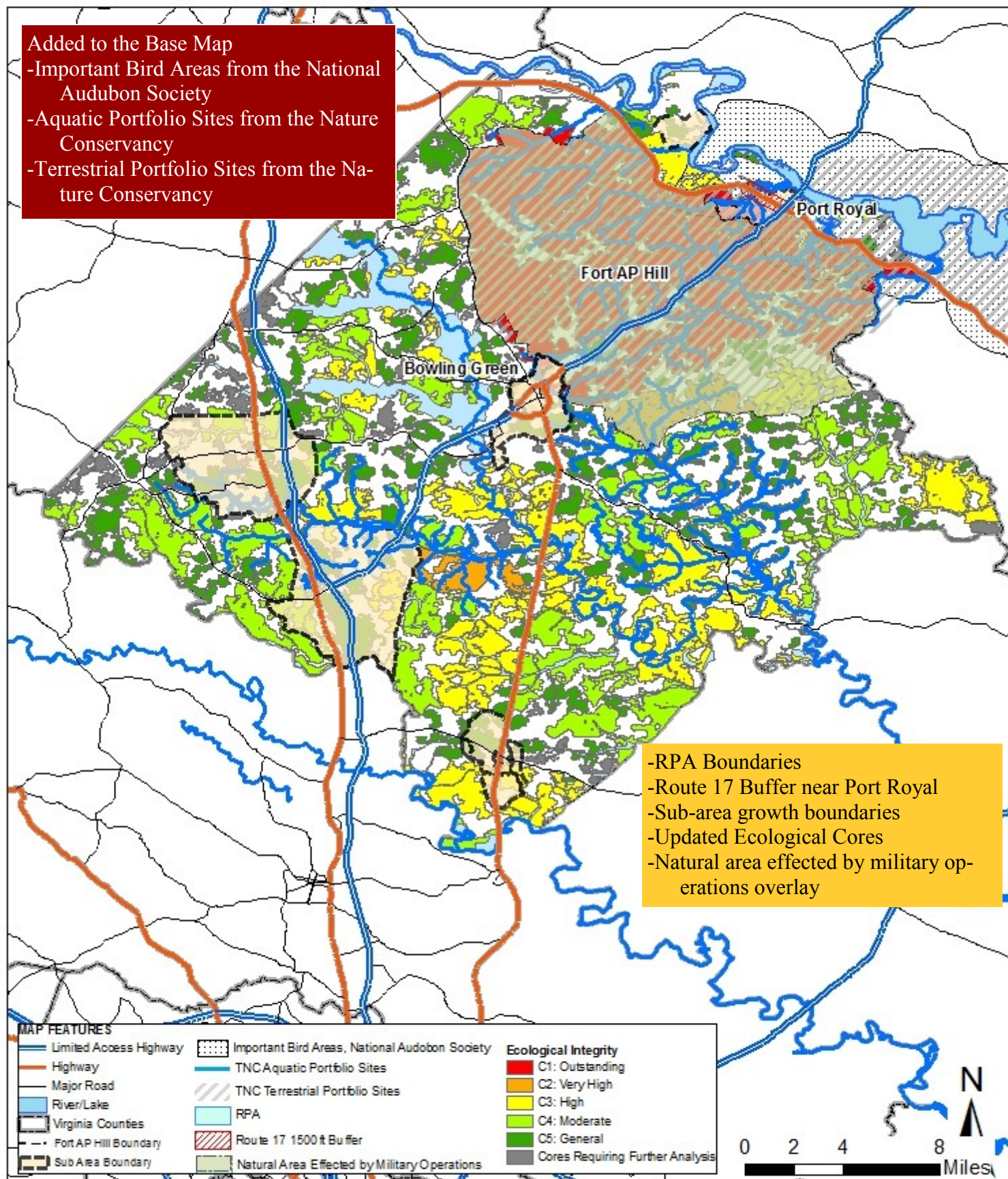
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# Caroline County: Ecological Core Update

## Added to the Base Map

- Important Bird Areas from the National Audubon Society
- Aquatic Portfolio Sites from the Nature Conservancy
- Terrestrial Portfolio Sites from the Nature Conservancy



Map created by GWRC staff, August 2009  
hammig@gwrc.org

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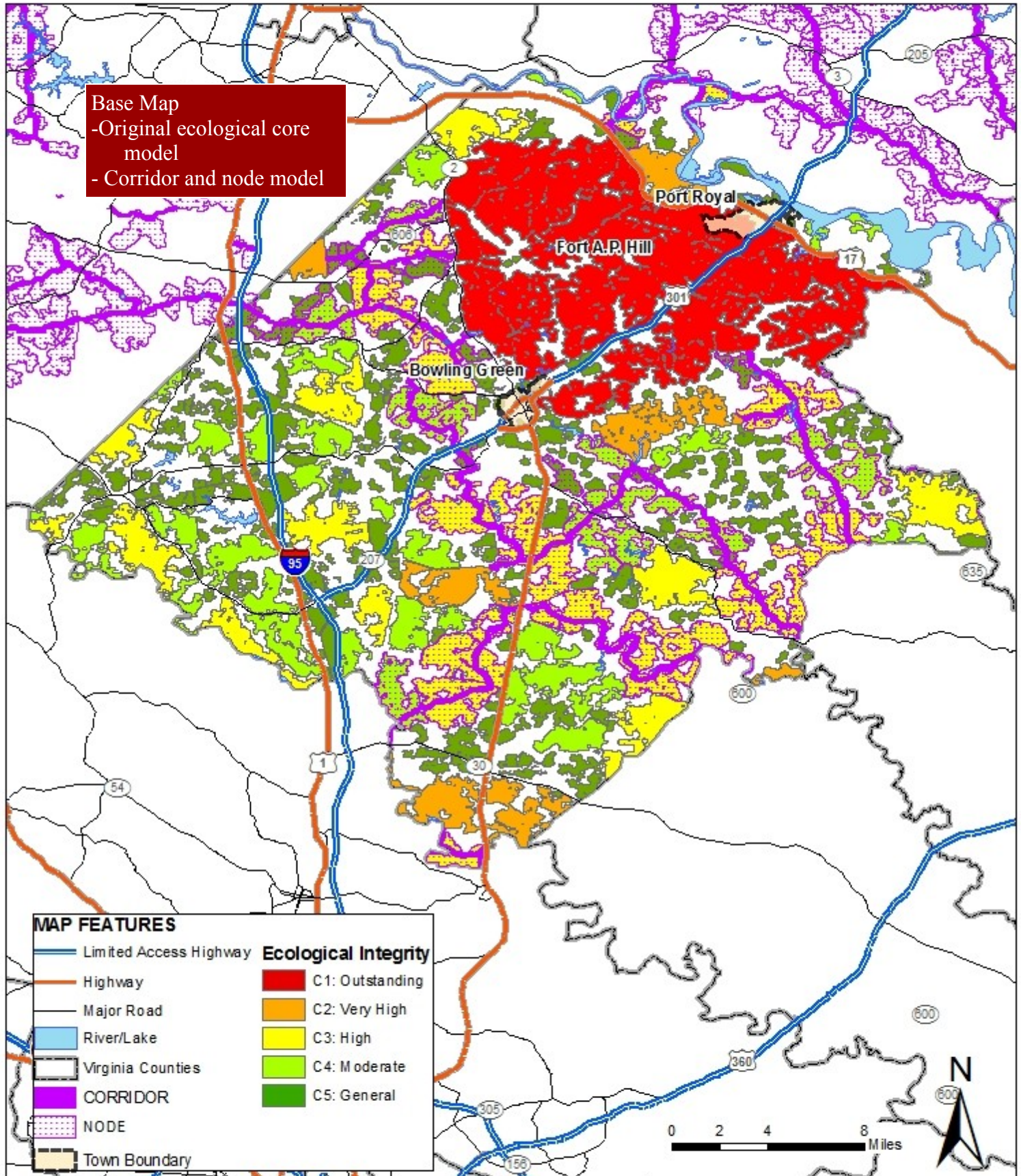


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# Caroline County: Ecological Corridors and Nodes



Map created by GWRC staff, August 2009  
 hamming@gwregion.org

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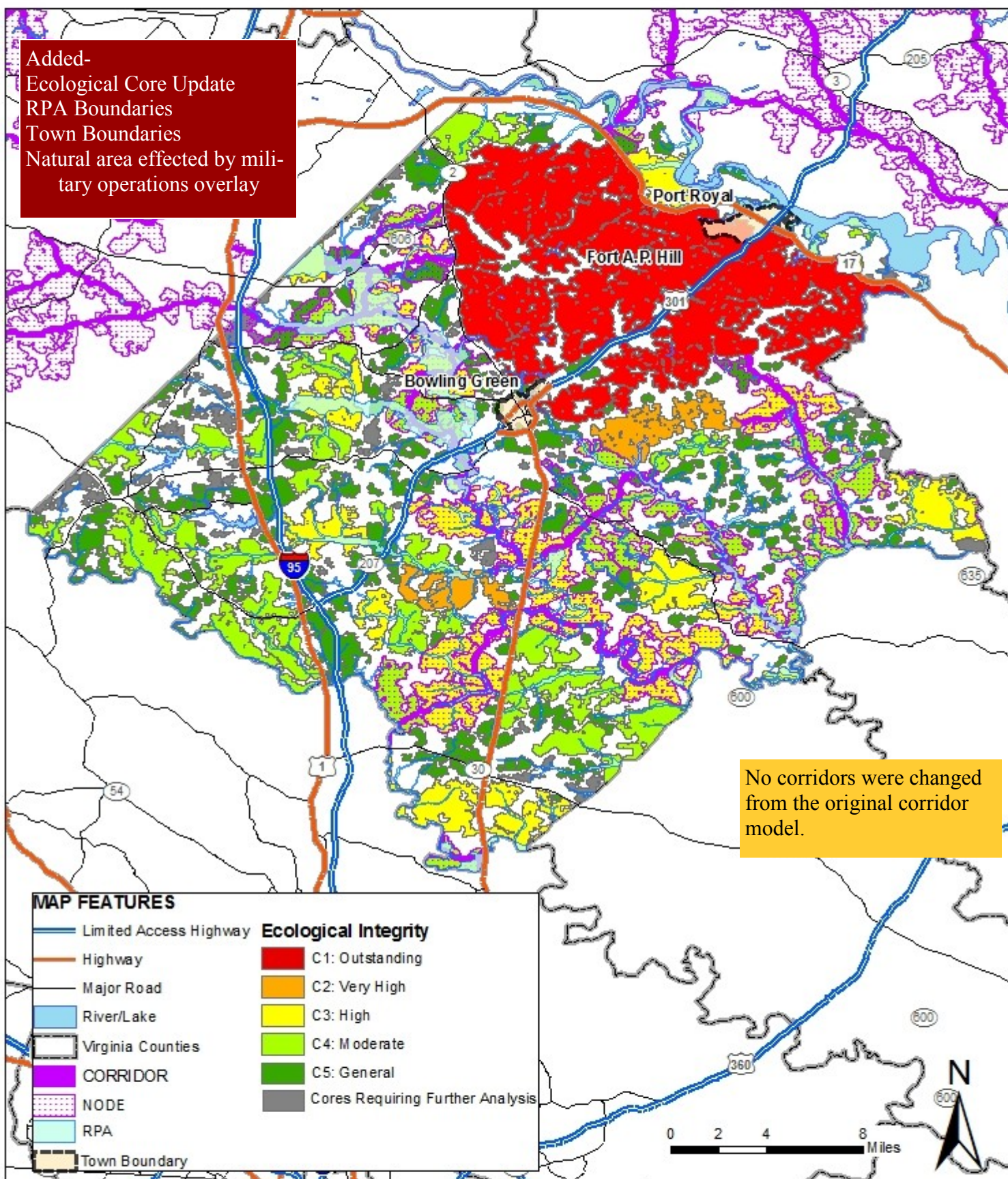


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# Caroline County: Ecological Corridors and Nodes Update

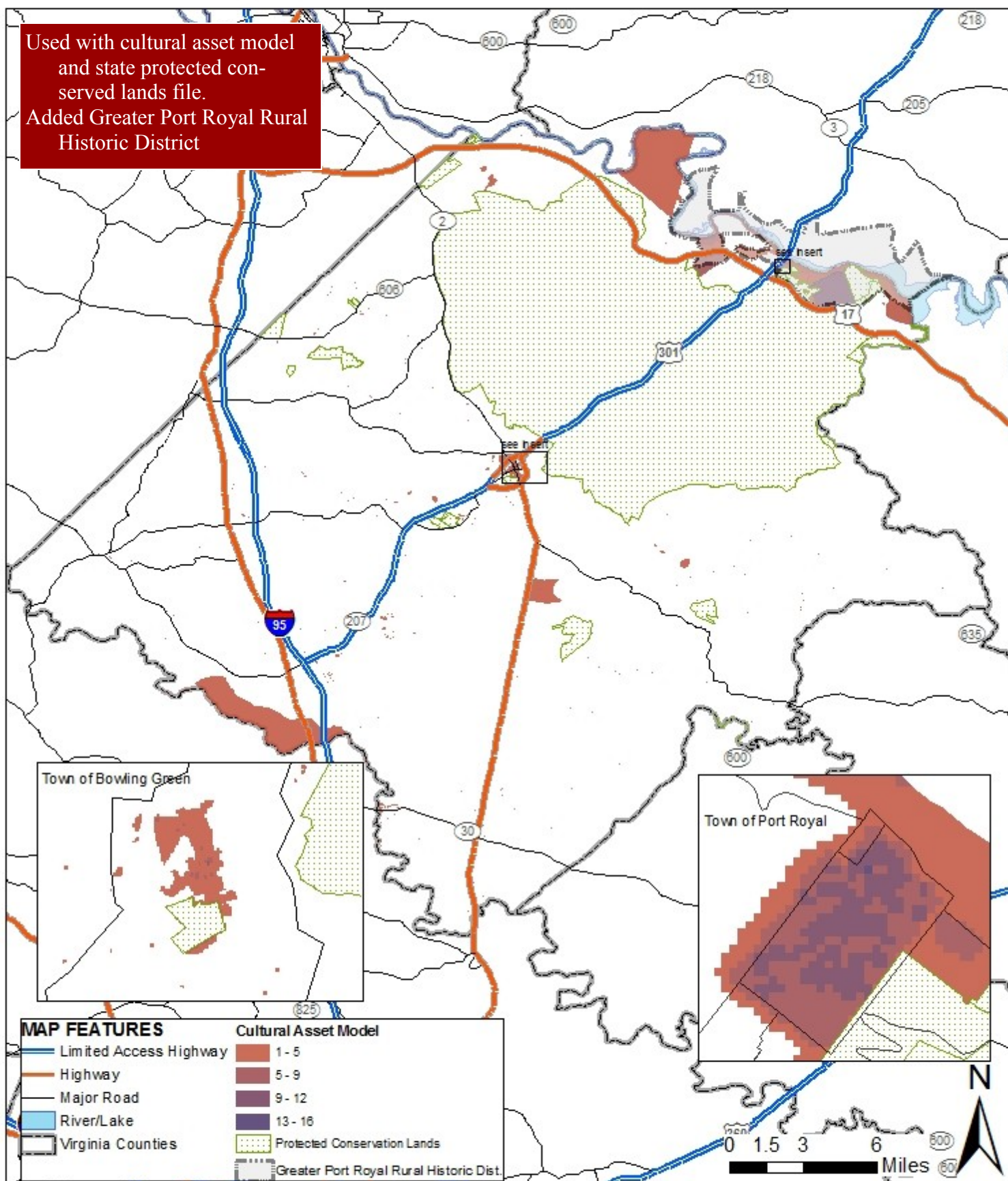


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# Caroline County: Cultural and Conserved Lands



Map created by GWRC staff, August 2009  
hammig@gwregion.org

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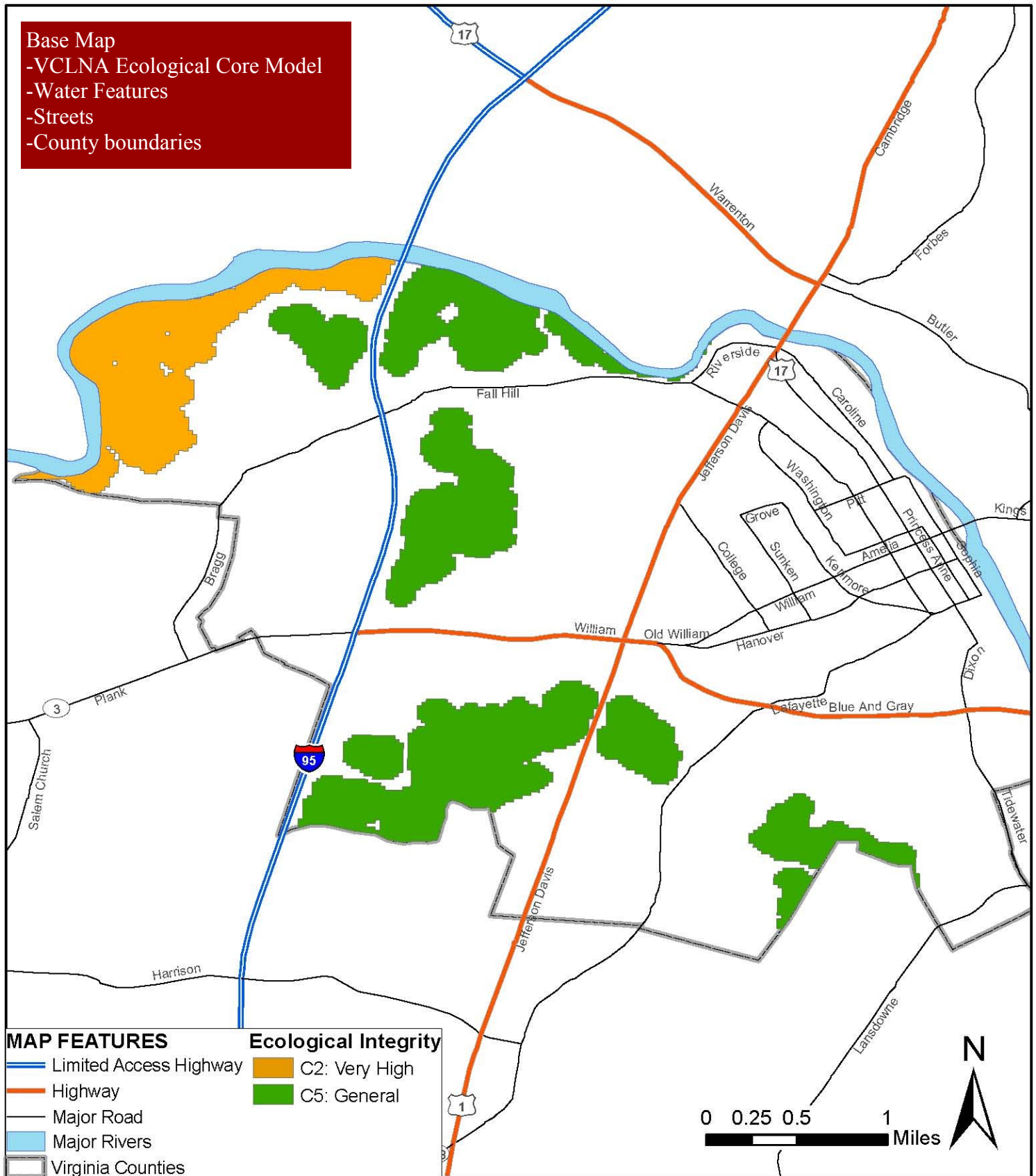


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# City of Fredericksburg: Ecological Cores

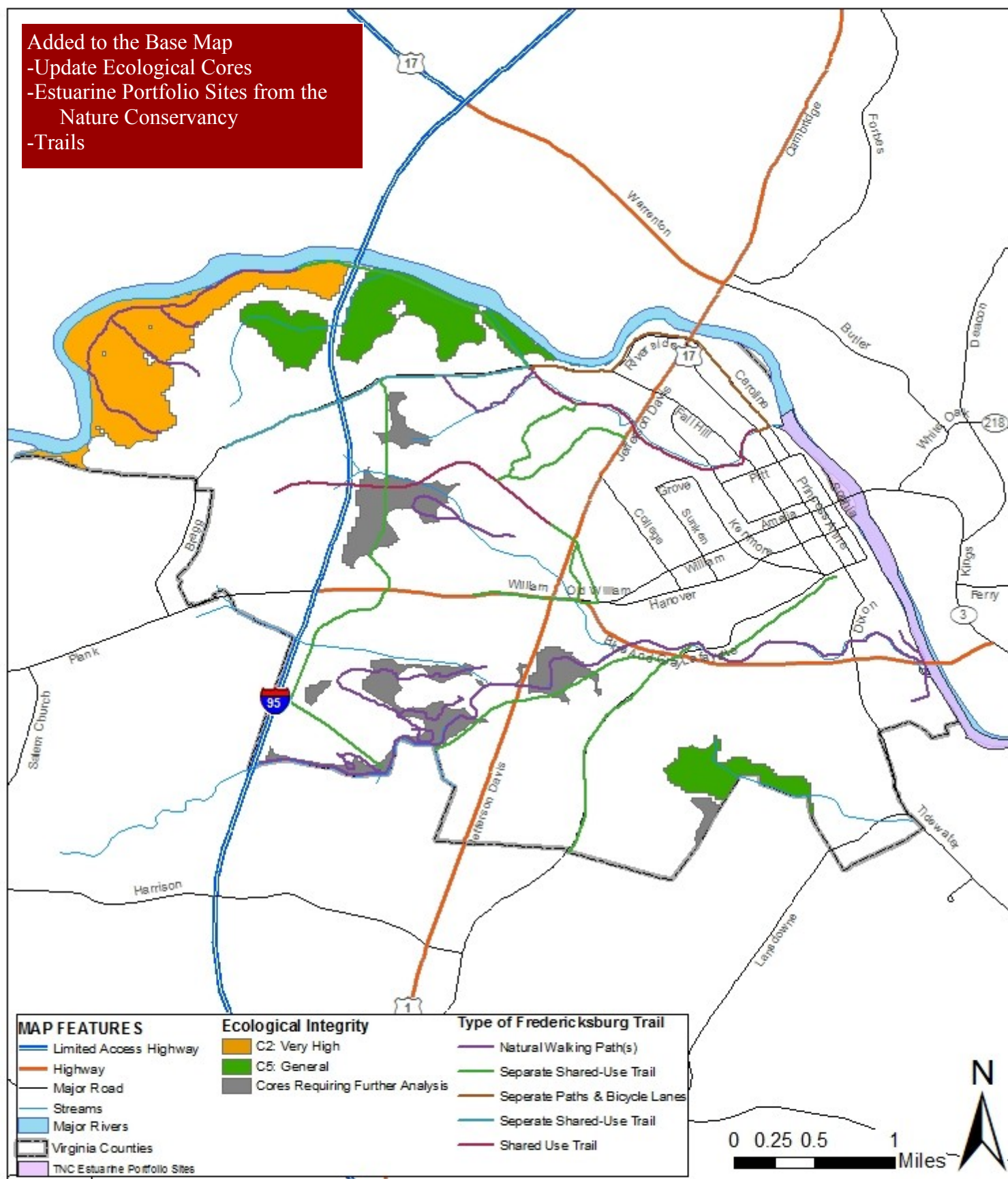


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# City of Fredericksburg: Ecological Core Update

Added to the Base Map  
 -Update Ecological Cores  
 -Estuarine Portfolio Sites from the Nature Conservancy  
 -Trails

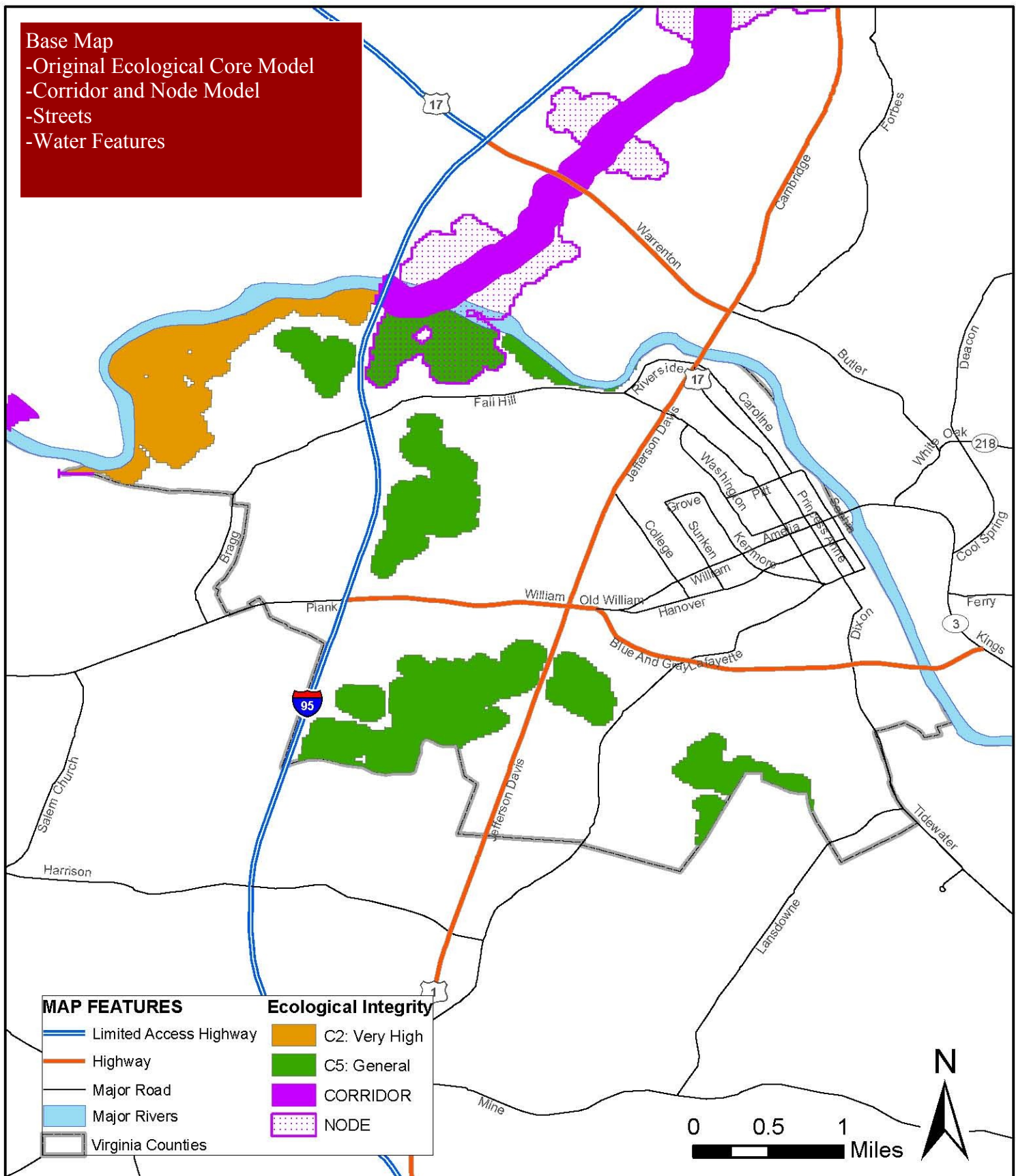


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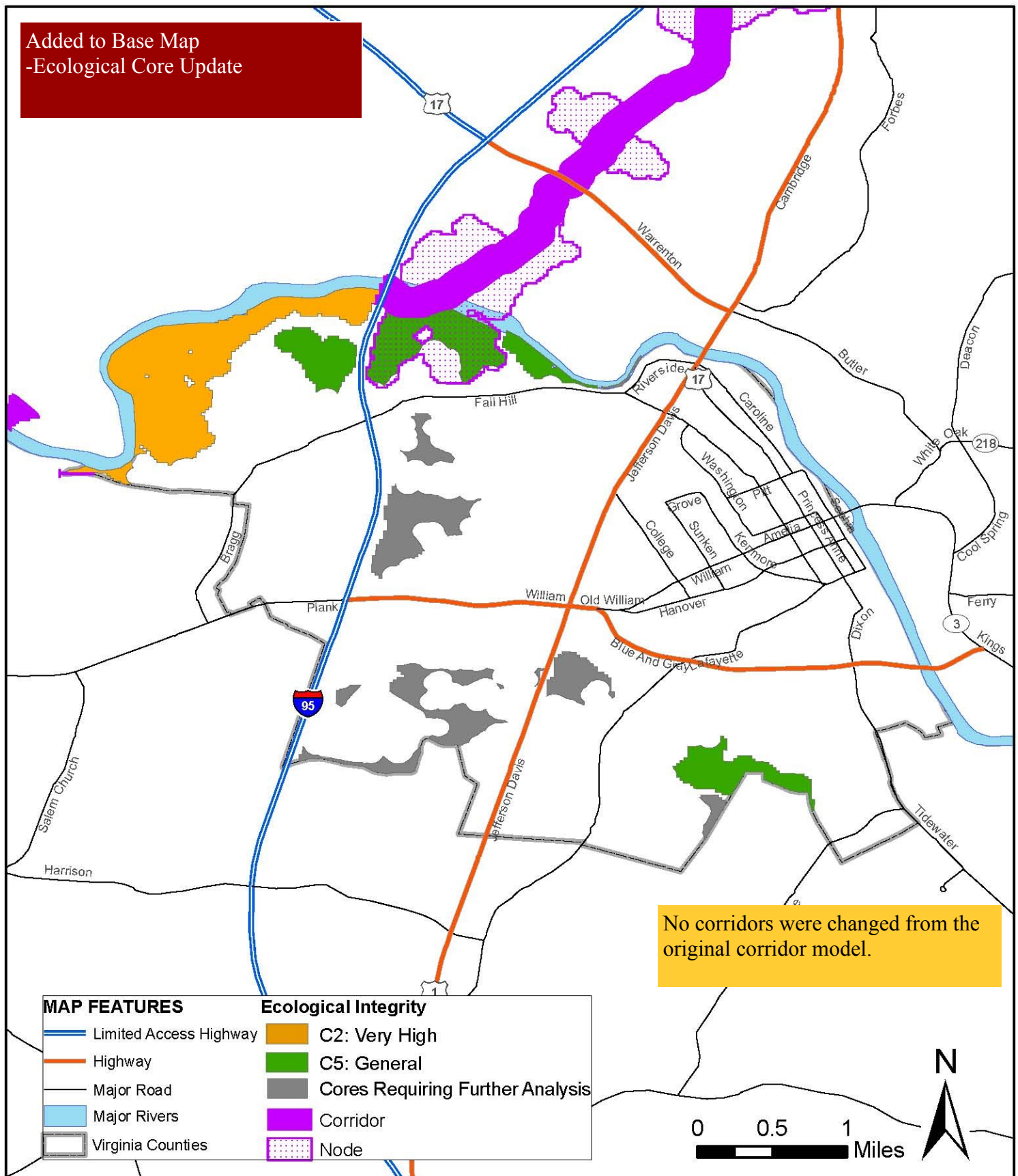
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# City of Fredericksburg: Ecological Corridors and Nodes Update



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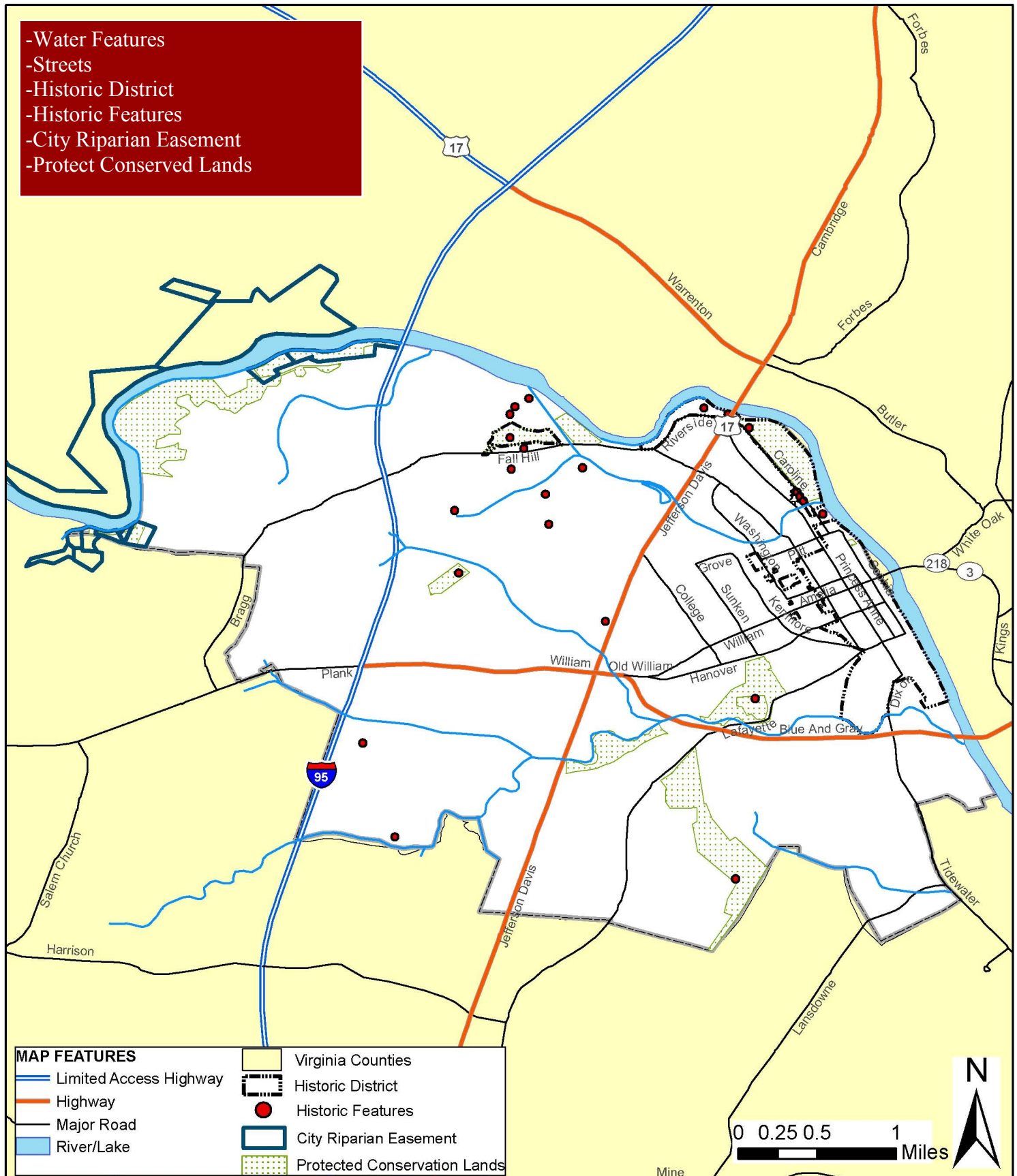


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# City of Fredericksburg: Cultural and Conserved Lands

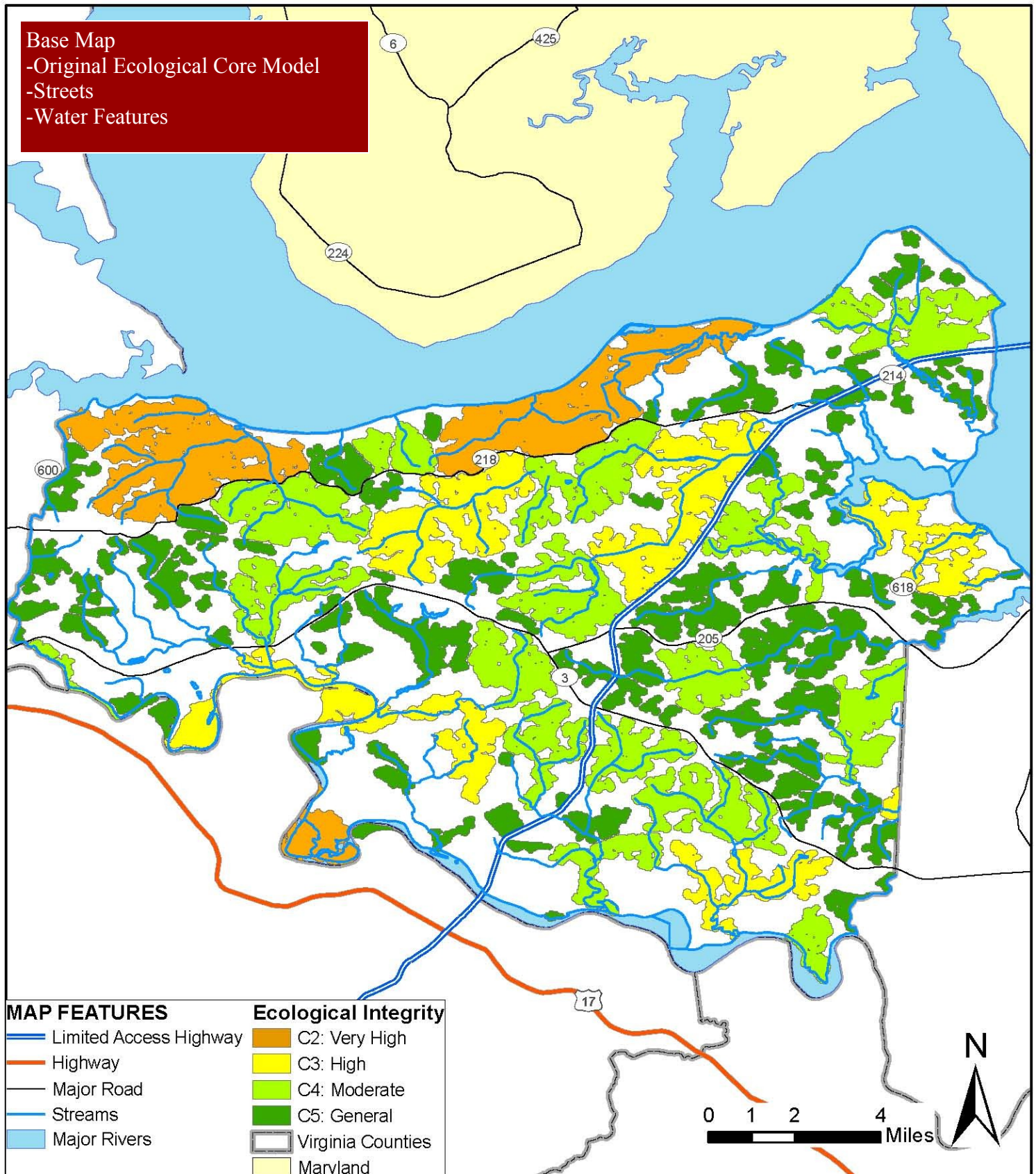


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# King George County: Ecological Cores



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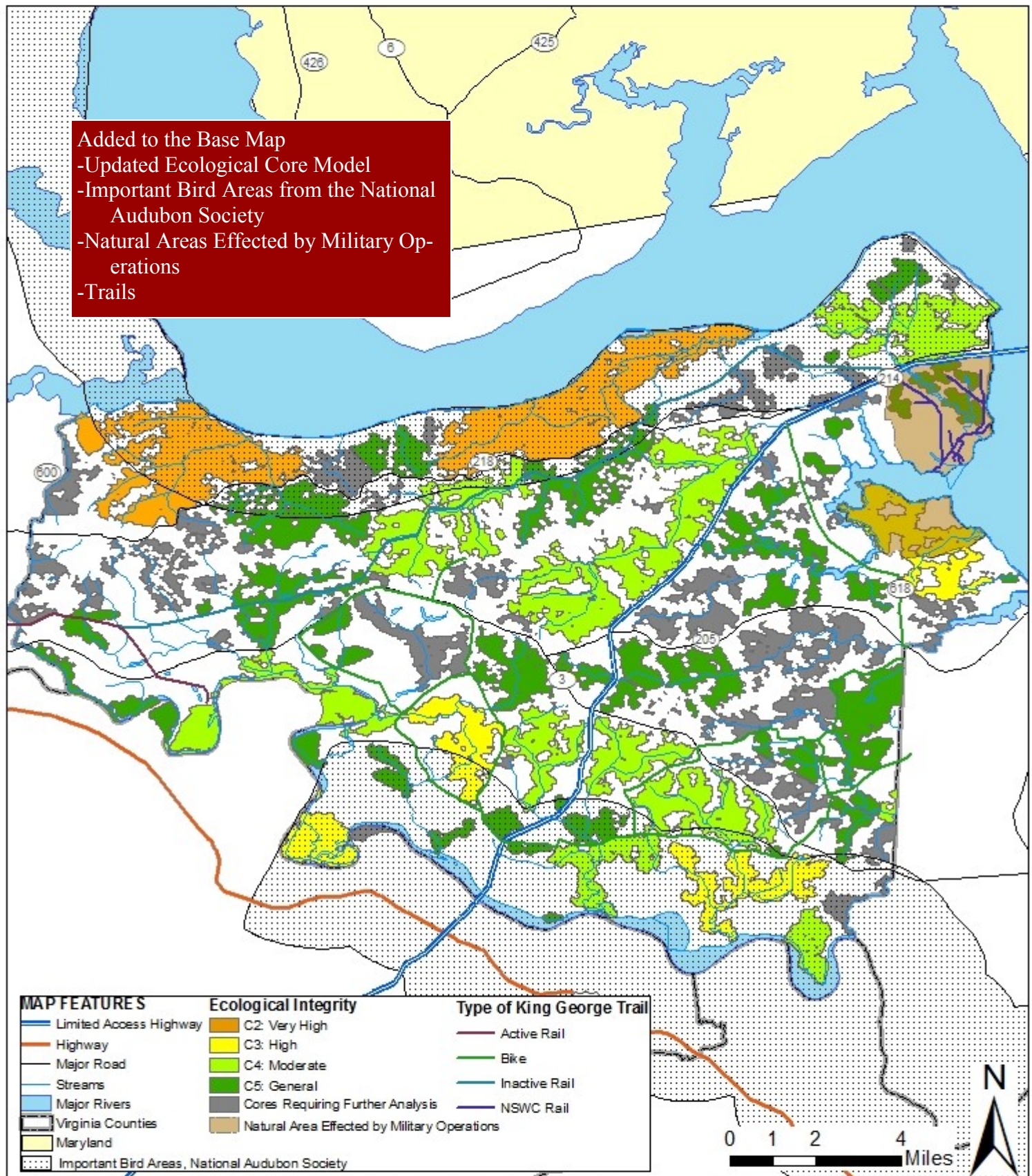


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# King George County: Ecological Core Update



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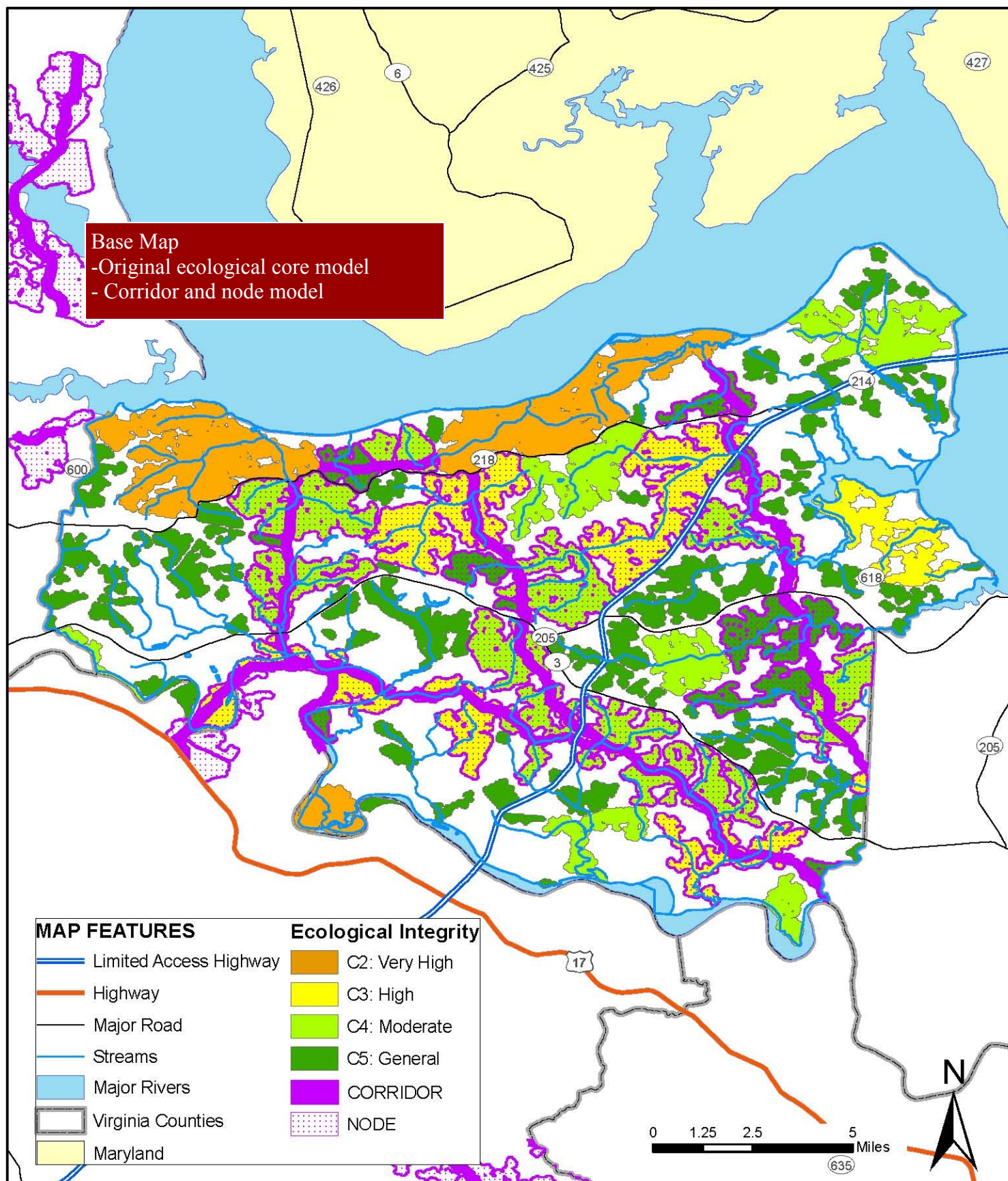


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# King George County: Ecological Corridors and Nodes



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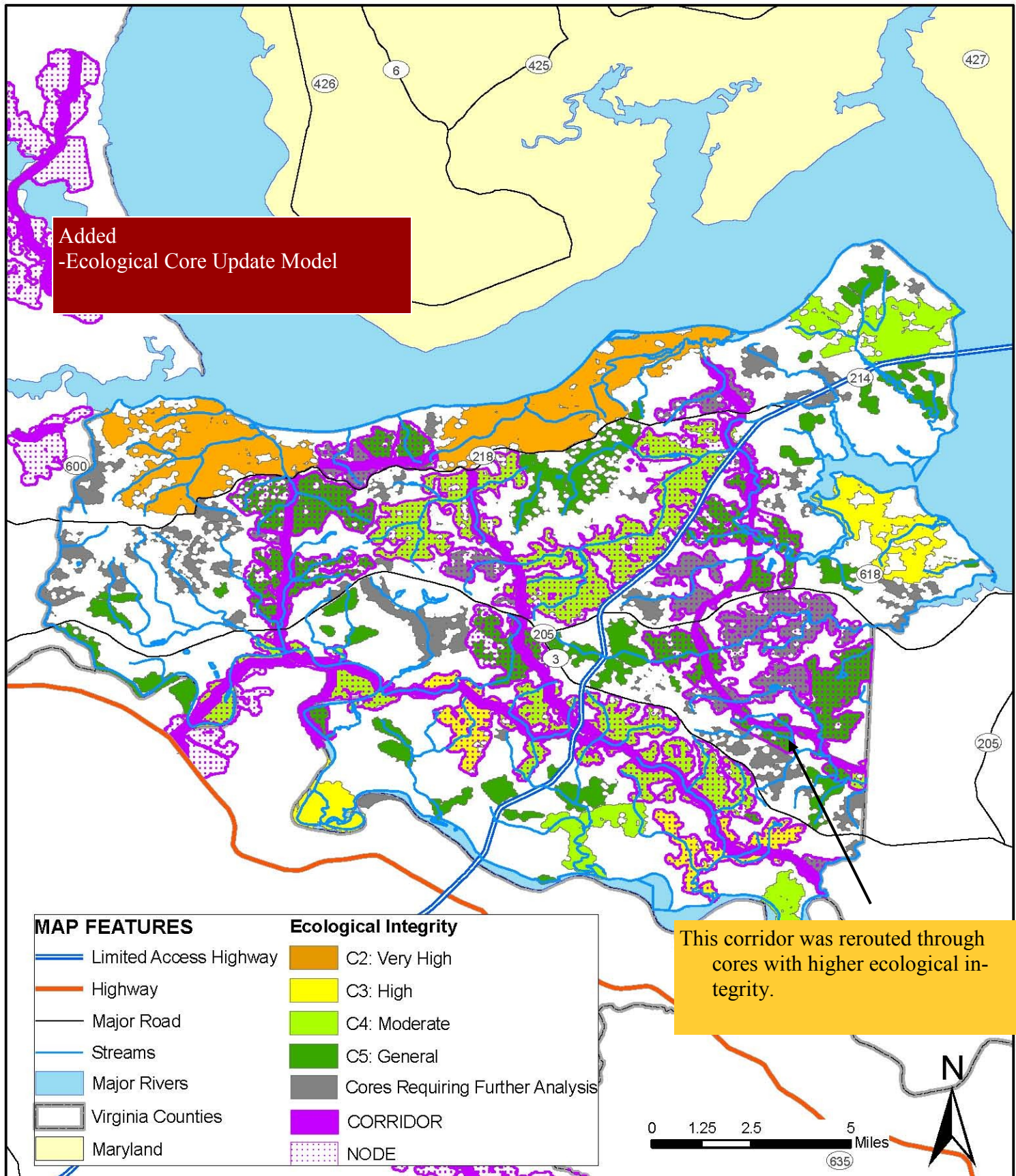


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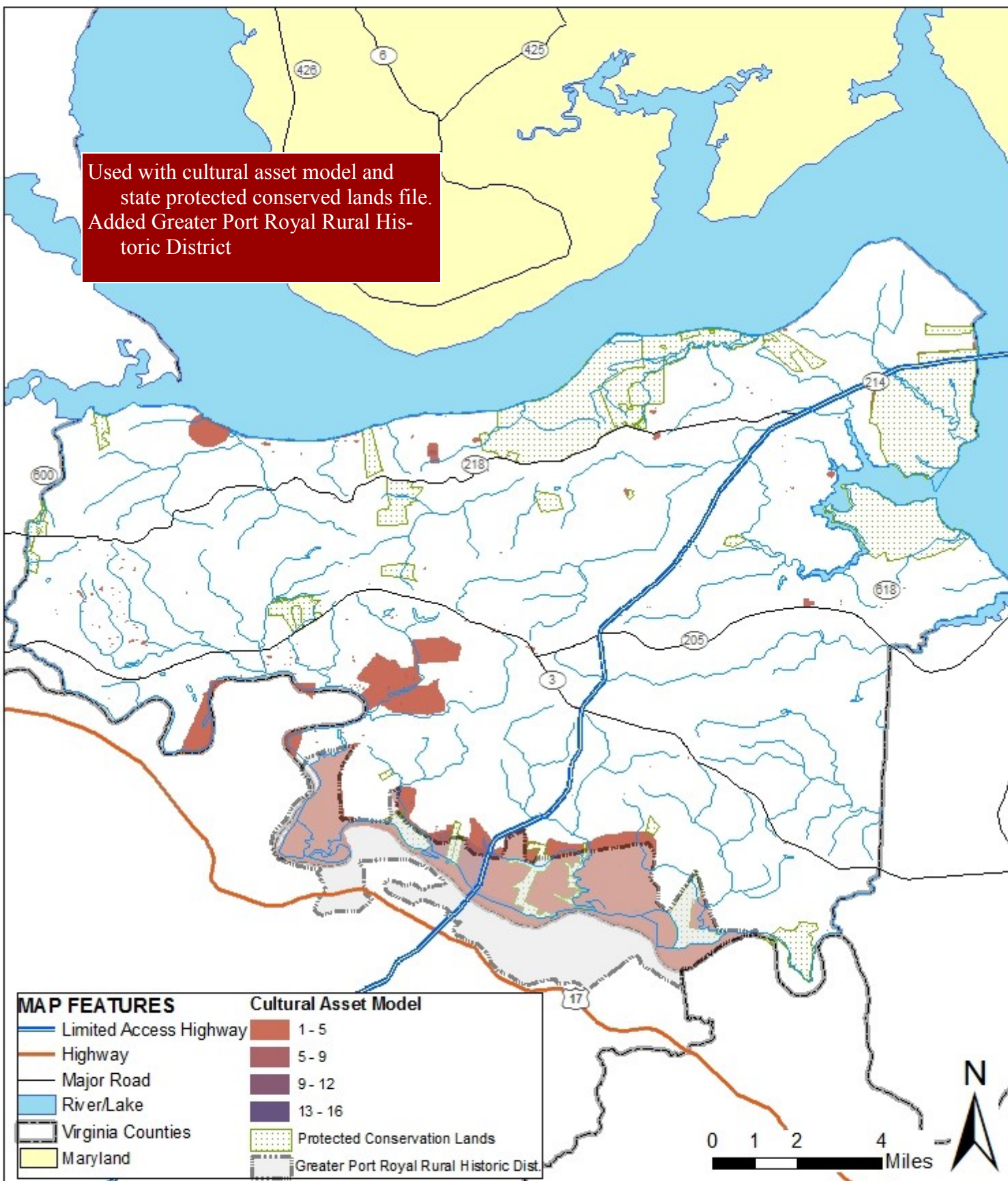


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# King George County: Cultural and Conserved Lands



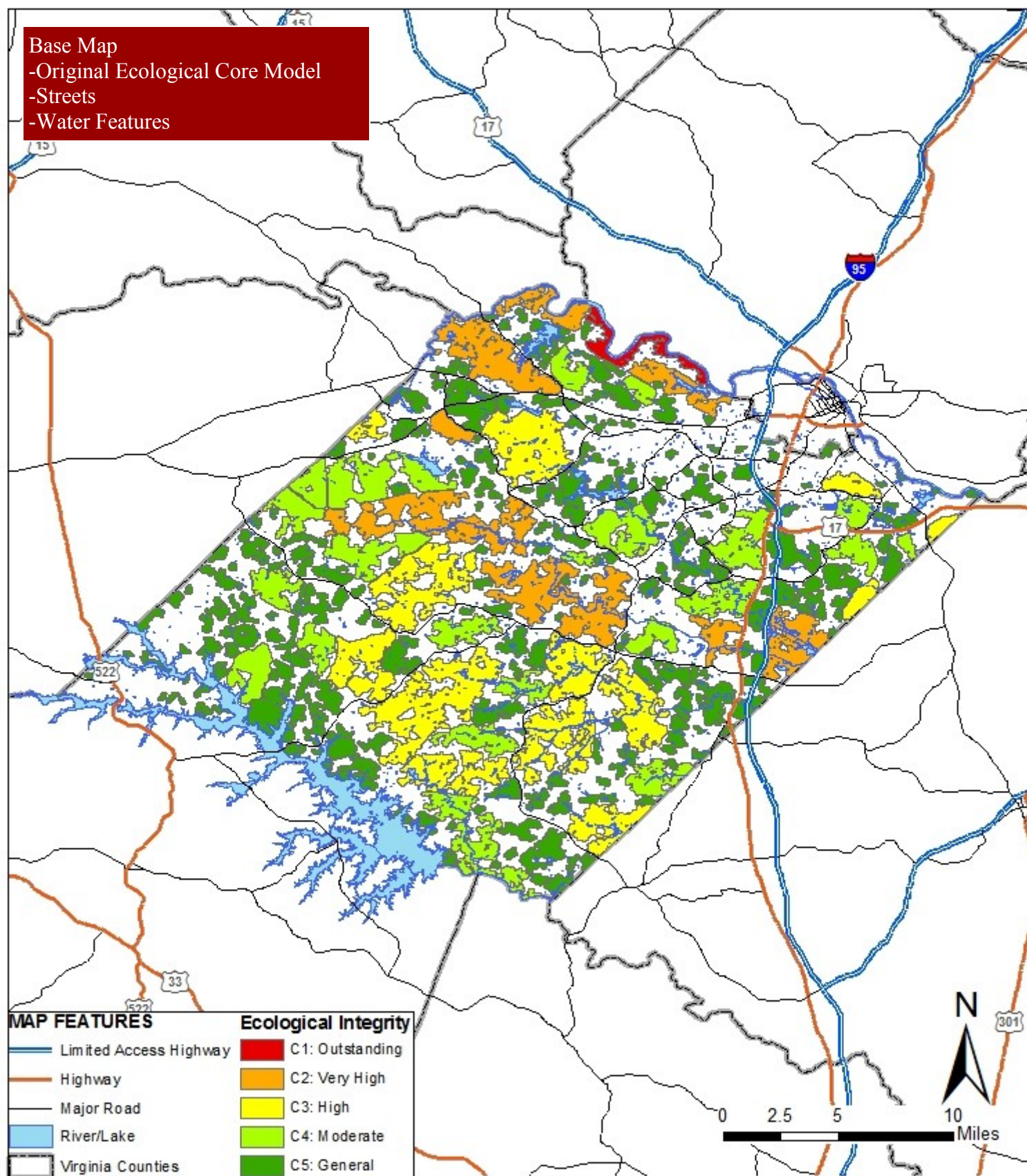
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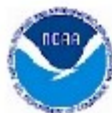
# Spotsylvania County: Ecological Cores



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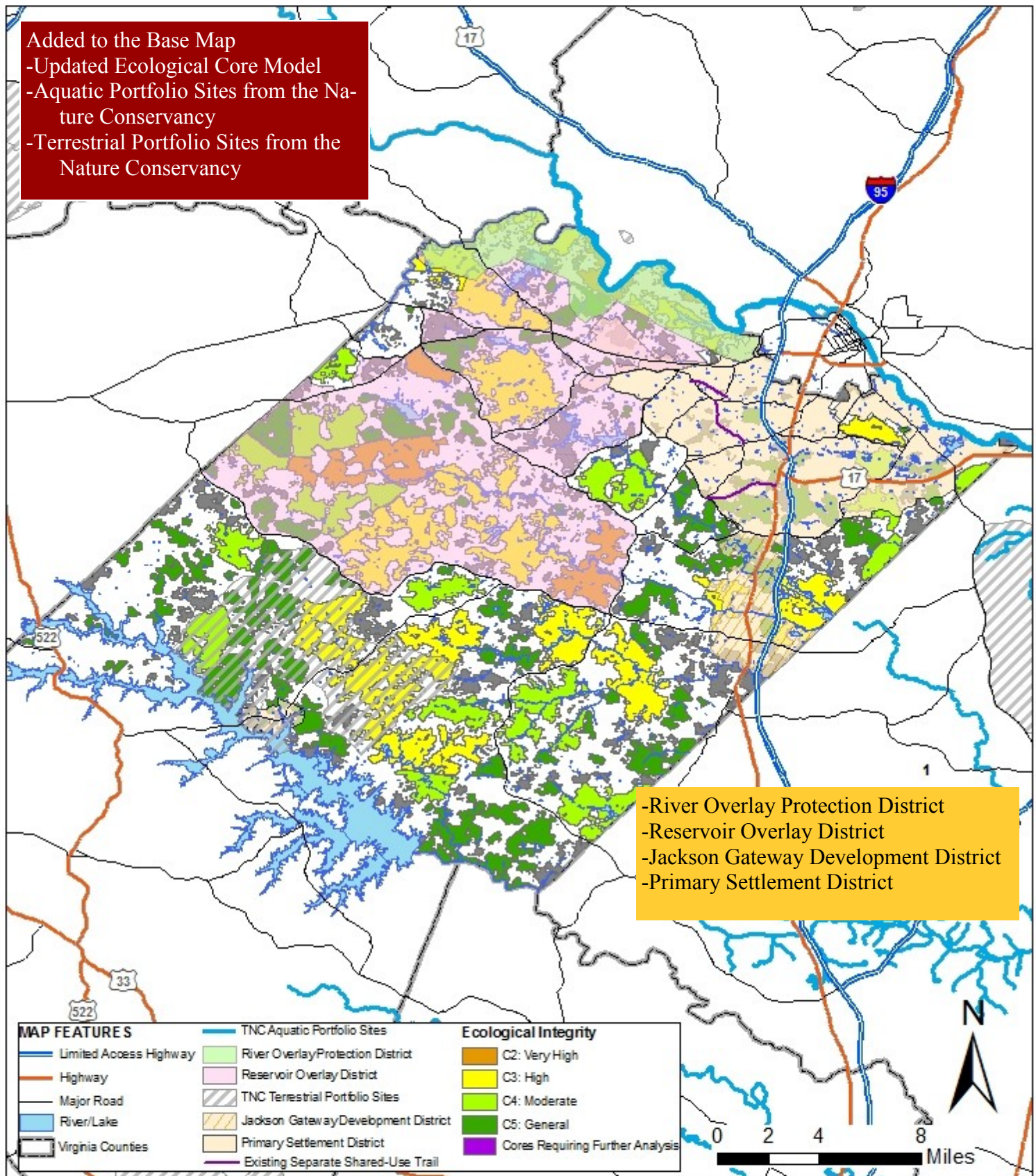
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# Spotsylvania County: Ecological Cores Update

Added to the Base Map  
 -Updated Ecological Core Model  
 -Aquatic Portfolio Sites from the Nature Conservancy  
 -Terrestrial Portfolio Sites from the Nature Conservancy



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 hammig@gwregion.org

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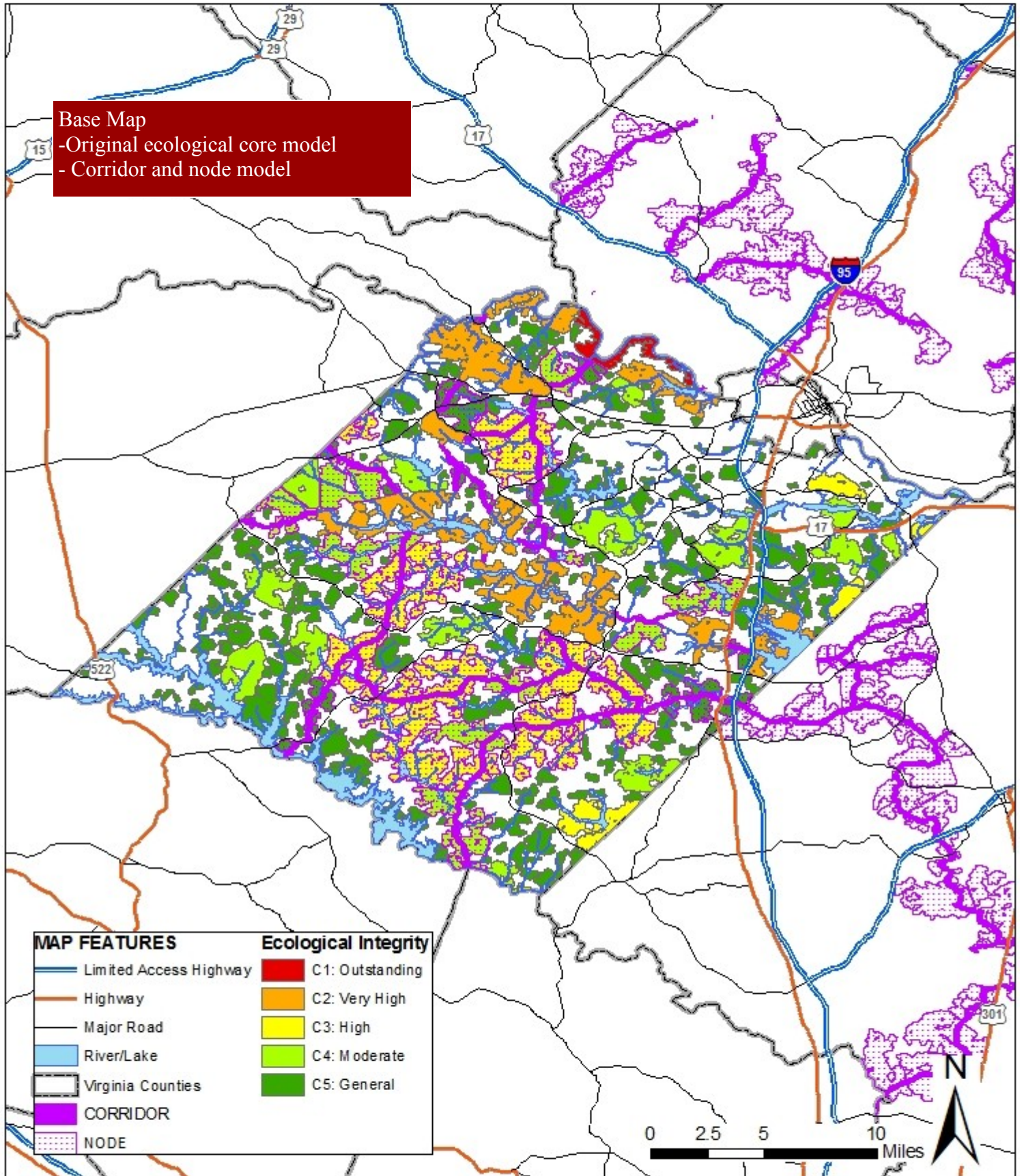


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# Spotsylvania County: Ecological Corridors and Nodes



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hammig@gwregion.org

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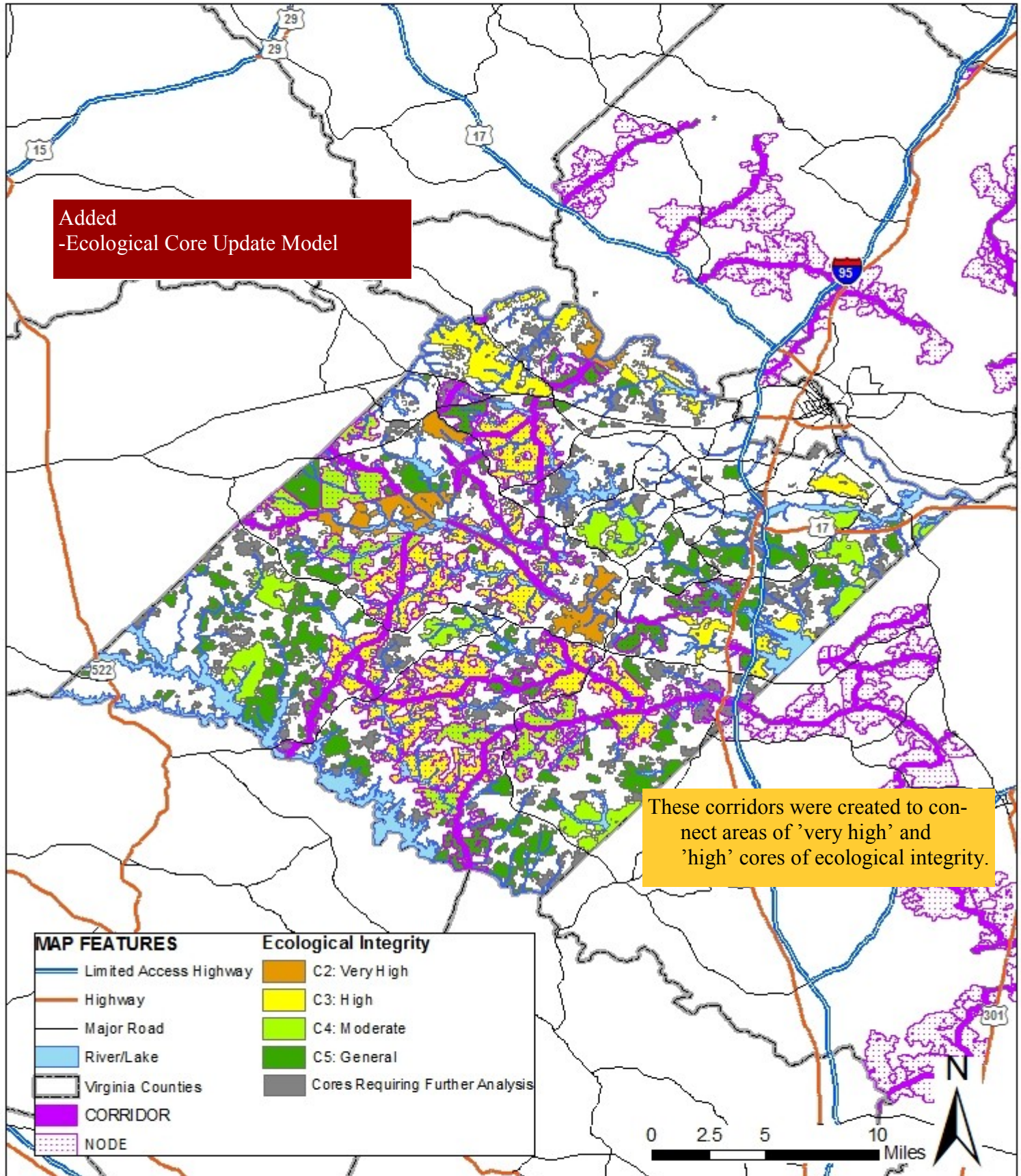


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# Spotsylvania County: Ecological Corridors and Nodes Update



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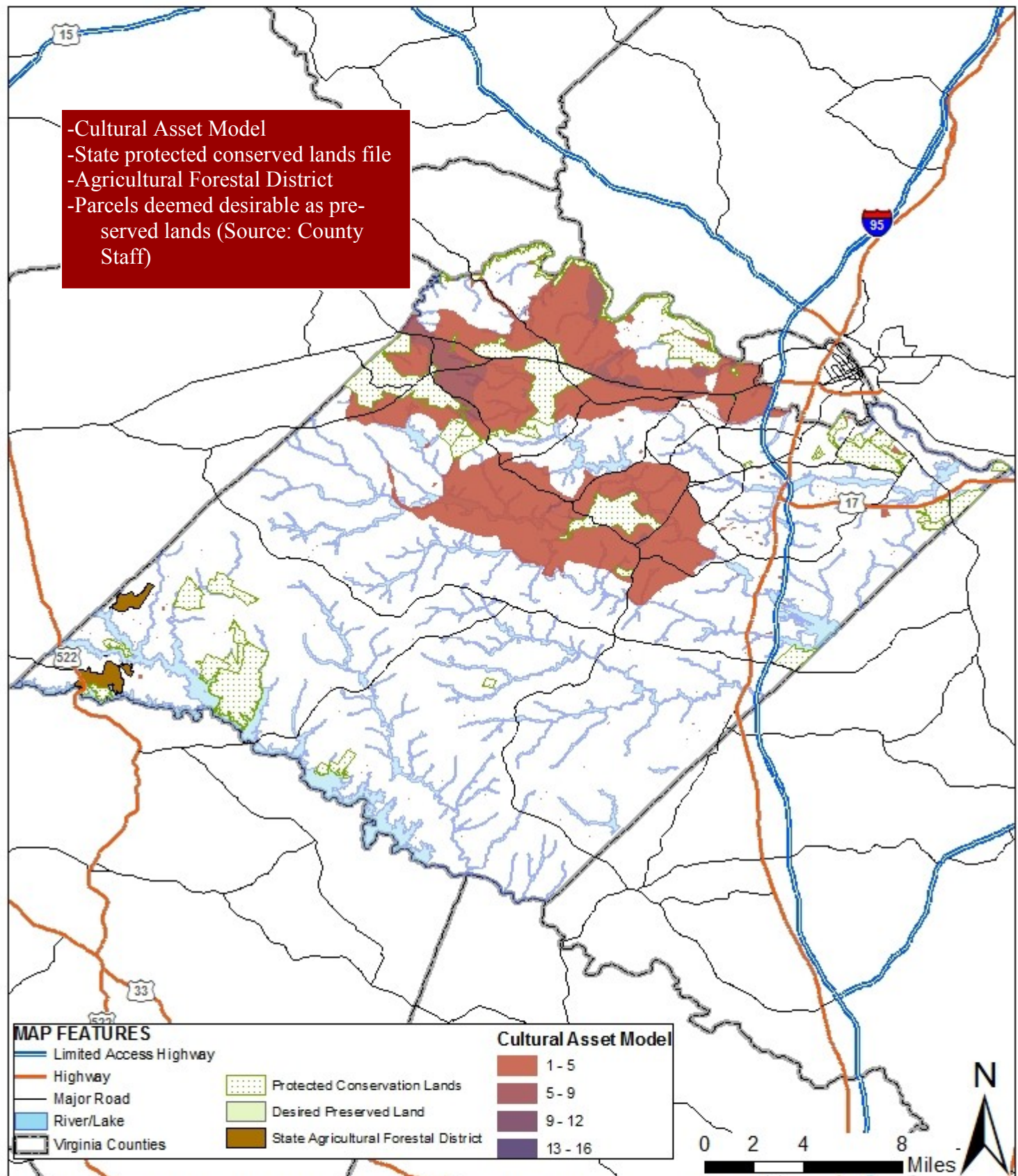


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# Spotsylvania County: Cultural and Conserved Lands



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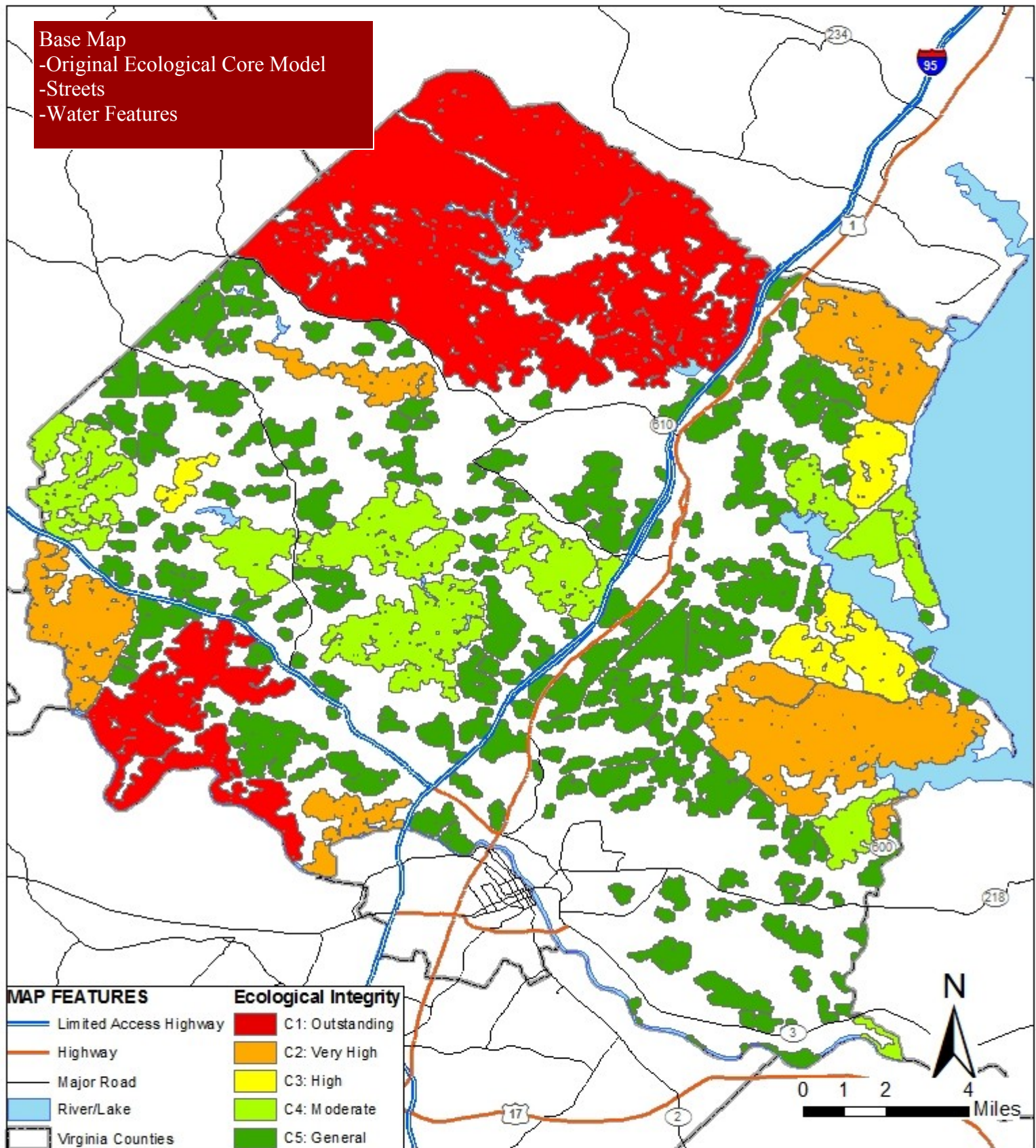
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# Stafford County: Ecological Cores

## Base Map

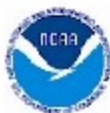
- Original Ecological Core Model
- Streets
- Water Features



Map created by GWRC staff, August 2009  
hammig@gwregion.org

Source data supplied on February 26, 2009 by the Virginia  
Dept. of Conservation and Recreation, Division of Natural Heritage

This project was funded, in part, by the Virginia Coastal Zone Management Program at the Department of Environmental Quality through Grant #NA 08NOS4190468 of the U.S. Department of Commerce, National Oceanic and Atmospheric Administration, under the Coastal Zone Management Act of 1972, as amended. Any views expressed herein are those of the author(s) and do not necessarily reflect the views of the U.S. Department of Commerce, NOAA, or any of its subagencies.

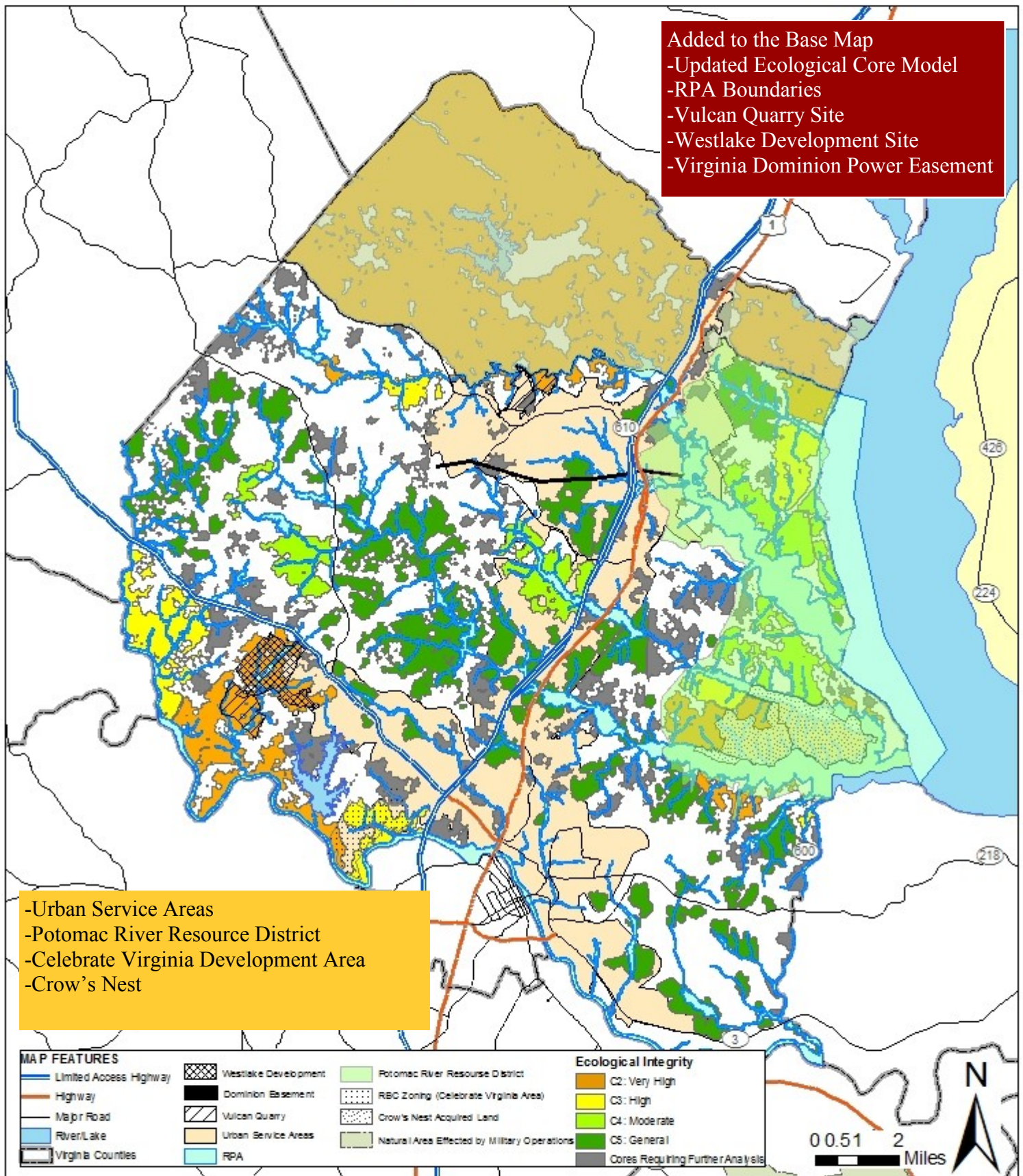


**Virginia Coastal Zone**  
MANAGEMENT PROGRAM

**GEORGE WASHINGTON**  
REGIONAL COMMISSION



# Stafford County: Ecological Core Update



Map created by GWRC staff, August 2009  
hammig@gwregion.org

Source data supplied on February 26, 2009 by the Virginia  
Dept. of Conservation and Recreation, Division of Natural Heritage

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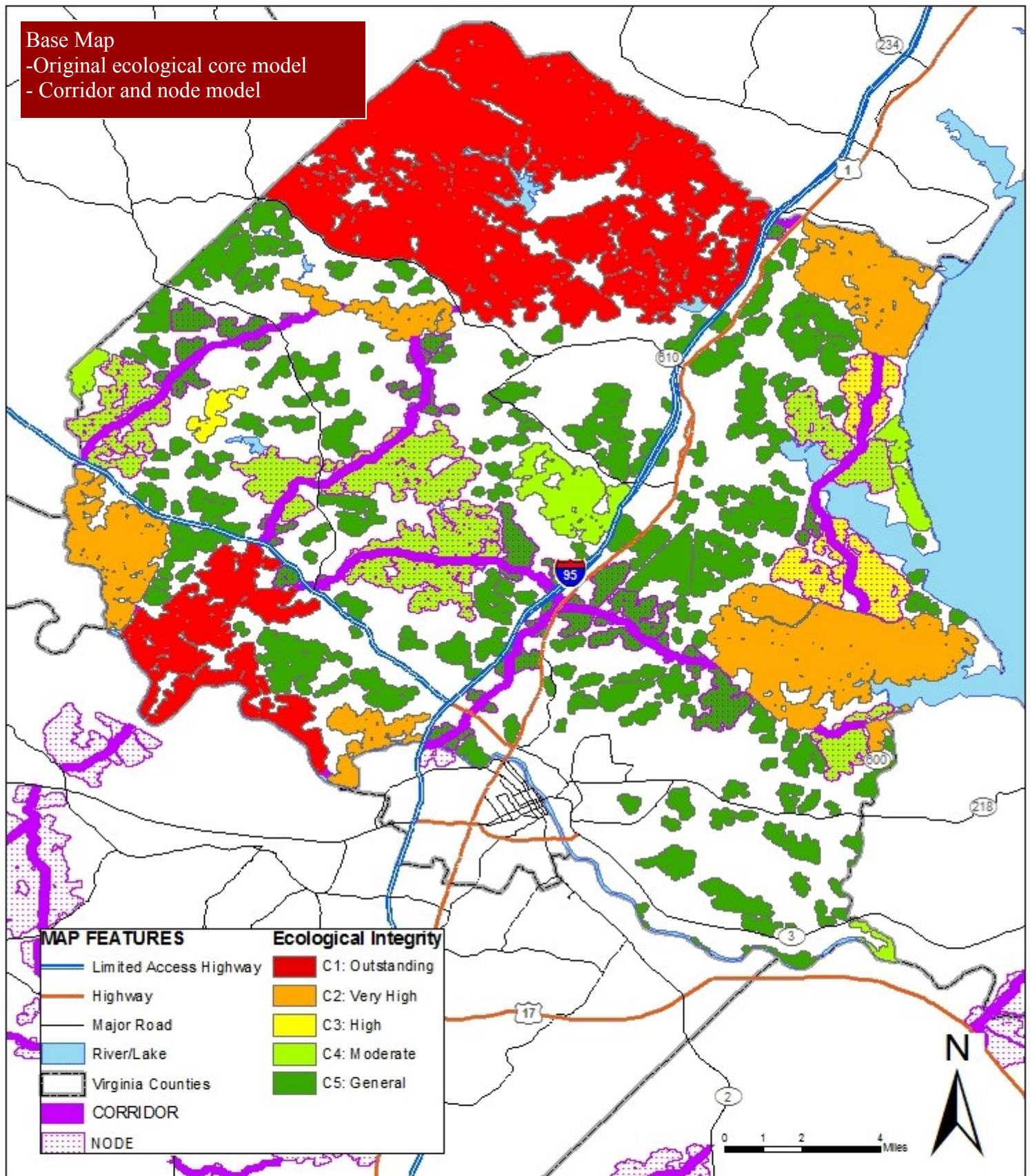


**Virginia Coastal Zone**  
MANAGEMENT PROGRAM

**GEORGE WASHINGTON**  
REGIONAL COMMISSION



# Stafford County: Ecological Corridors and Nodes



Map created by GWRC staff, August 2009  
 hamming@gwregion.org

Source data supplied on February 26, 2009 by the Virginia  
 Dept. of Conservation and Recreation, Division of Natural Heritage

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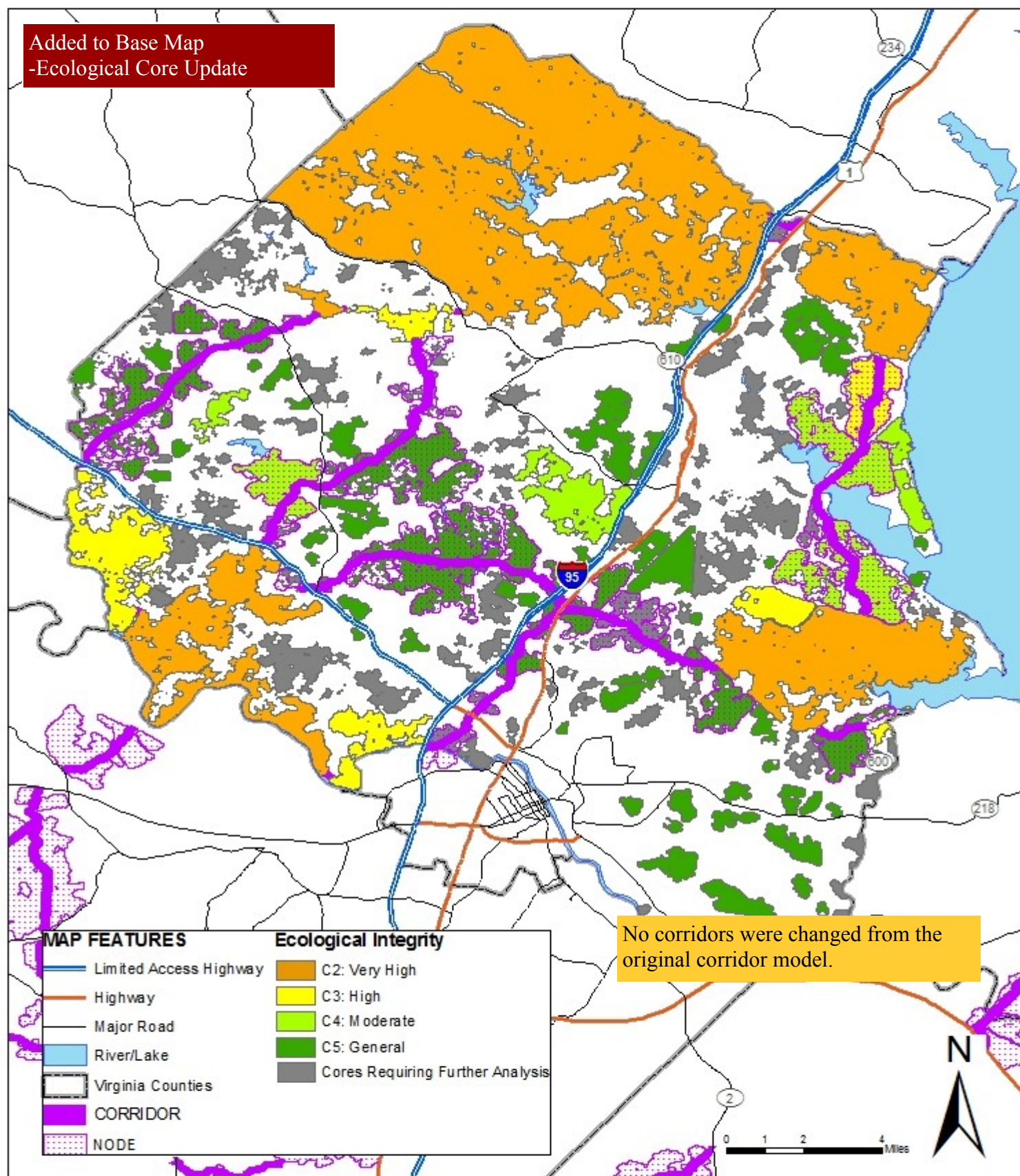
**Virginia Coastal Zone**  
 MANAGEMENT PROGRAM

**GEORGE WASHINGTON**  
 REGIONAL COMMISSION



# Stafford County: Ecological Corridors and Nodes Update

Added to Base Map  
-Ecological Core Update



Map created by GWRC staff, August 2009  
hammig@gwregion.org

Source data supplied on February 26, 2009 by the Virginia  
Dept. of Conservation and Recreation, Division of Natural Heritage

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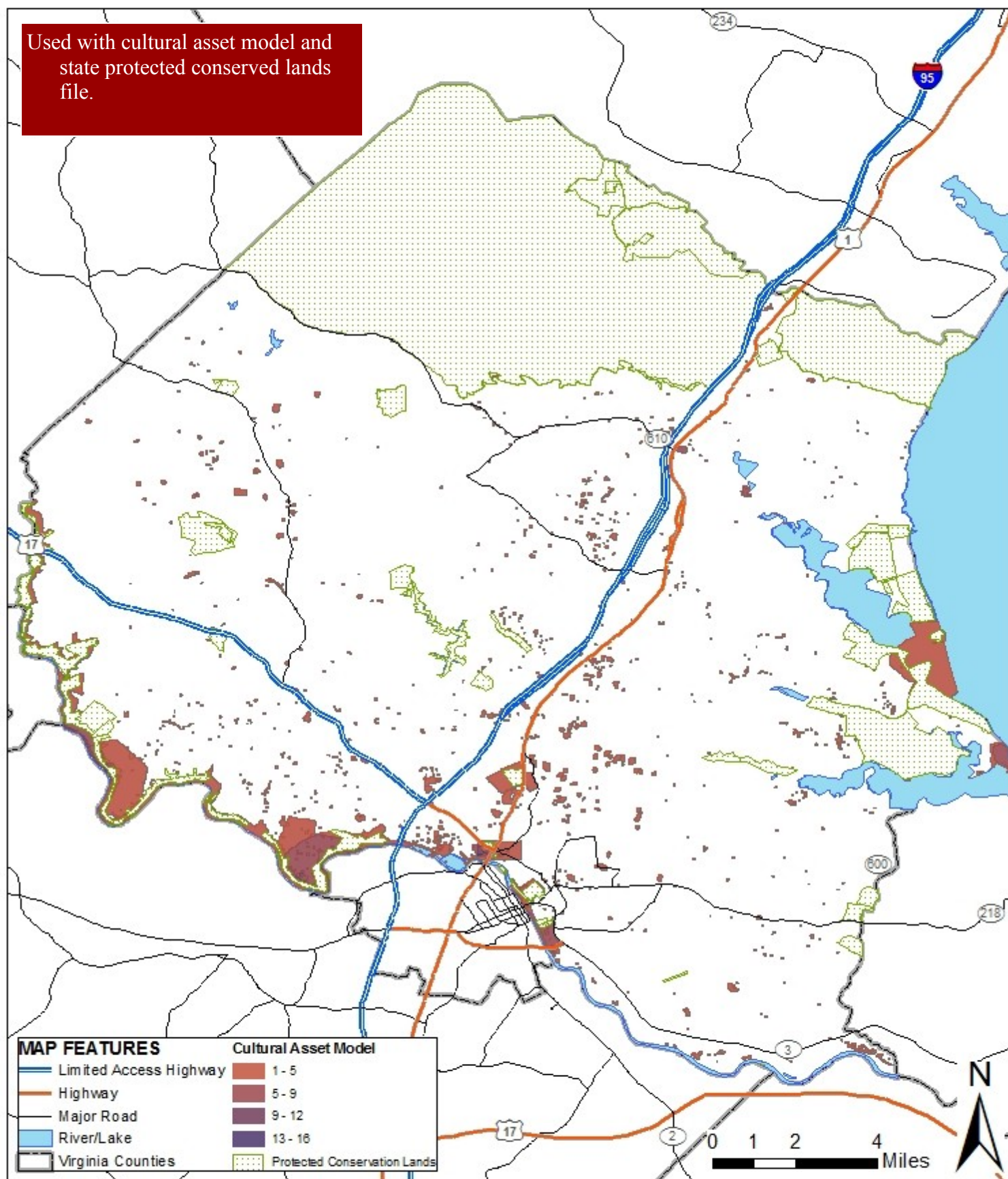
**Virginia Coastal Zone**  
MANAGEMENT PROGRAM

**GEORGE WASHINGTON**  
REGIONAL COMMISSION



# Stafford County: Cultural and Conserved Lands

Used with cultural asset model and state protected conserved lands file.



Map created by GWRC staff, August 2009  
hammig@gwregion.org

Source data supplied on February 26, 2009 by the Virginia  
Dept. of Conservation and Recreation, Division of Natural Heritage

This project was funded, in part, by the Virginia Coastal Zone Management Program at the Department of Environmental Quality through Grant #NA 08NOS 4190466 of the U.S. Department of Commerce, National Oceanic and Atmospheric Administration, under the Coastal Zone Management Act of 1972, as amended. Any views expressed herein are those of the author(s) and do not necessarily reflect the views of the U.S. Department of Commerce, NOAA, or any of its subagencies.



**Virginia Coastal Zone**  
MANAGEMENT PROGRAM

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## Metadata for Updated Landscape Corridors

### Identification\_Information:

#### Citation:

##### Citation\_Information:

Originator: Virginia Department of Conservation and Recreation and GWRC

Publication\_Date: 20090916

Title: Virginia Natural Landscape Assessment -- Coastal Zone Corridors and Nodes Updated

Geospatial\_Data\_Presentation\_Form: vector digital data

Online\_Linkage: \\server02\green init\GWRC\_VCLNA\Models Clipped to GWRC\LandscapeCorridors\_GWRC\_lam83\_Update.shp

#### Description:

Abstract: The Natural Landscape Assessment (NLA), a component of the Virginia Conservation Lands Needs Assessment (VCLNA), is a landscape-scale GIS analysis for identifying, prioritizing, and linking natural habitats in Virginia. Using land cover data derived from satellite imagery, the NLA identifies unfragmented natural habitats called cores, large patches of natural land cover (mainly upland forests and forested wetlands statewide, but also marshes, beaches, and dunes in the coastal plain) with at least 100 acres of interior conditions. Large, medium, and small cores have been identified (see definitions in attribute section), along with a smaller feature type called "habitat fragments" that may be important in the more urban localities. Cores provide habitat for a wide ranges of species, from forest interior-dependent to habitat-generalist species, as well as species that utilize marsh, dune, and beach habitats. Cores also provide benefits in terms of open space, recreation, water quality (including drinking water protection), and carbon sequestration, along with the associated economic benefits of these functions.

Purpose: The NLA generates fundamental ecological data layer for land and natural resources conservation in Virginia.

Supplemental\_Information: Updated by GWRC based on loss of ecological integrity during the ecological model update. Changes to corridors made in King George and Spotsylvania Counties.

#### Time\_Period\_of\_Content:

##### Time\_Period\_Information:

###### Single\_Date/Time:

Calendar\_Date: circa 2007

Currentness\_Reference: ground condition

#### Status:

Progress: Completed

Maintenance\_and\_Update\_Frequency: As needed

#### Spatial\_Domain:

##### Bounding\_Coordinates:

West\_Bounding\_Coordinate: -77.847793

East\_Bounding\_Coordinate: -77.035913

North\_Bounding\_Coordinate: 38.530000

South\_Bounding\_Coordinate: 37.770147

#### Keywords:

##### Theme:

Theme\_Keyword: Virginia Natural Landscape Assessment

Theme\_Keyword: VaNLA

##### Place:

Place\_Keyword\_Thesaurus: none

Place\_Keyword: Virginia

Place\_Keyword: Mid-Atlantic

##### Temporal:

Temporal\_Keyword\_Thesaurus: None

Temporal\_Keyword: 2007

Access\_Constraints: REQUIRED: Restrictions and legal prerequisites for accessing the data set.

Use\_Constraints: REQUIRED: Restrictions and legal prerequisites for using the data set after access is granted.

Completeness\_Report: Data are as complete as the source at the time of publication.

#### Positional\_Accuracy:

##### Horizontal\_Positional\_Accuracy:

Horizontal\_Positional\_Accuracy\_Report: As accurate as the source data.

##### Vertical\_Positional\_Accuracy:

Vertical\_Positional\_Accuracy\_Report: As accurate as the source data.

Source\_Scale\_Denominator: 0

#### Point\_of\_Contact:

##### Contact\_Information:

###### Contact\_Person\_Primary:

Contact\_Person: Laurel Hammig

Contact\_Organization: George Washington Regional Commission

Contact\_Position: Regional Planner

Contact\_Voice\_Telephone: (540) 373-2890

Contact\_Facsimile\_Telephone: (540) 899-4808

Contact\_Electronic\_Mail\_Address: hammig@gwregion.org

Hours\_of\_Service: 8:00 AM - 4:15 PM

Native\_Data\_Set\_Environment: Microsoft Windows XP Version 5.1 (Build 2600) Service Pack 3; ESRI ArcCatalog 9.3.0.1770

#### Data\_Quality\_Information:

##### Lineage:



Process\_Step:

Process\_Description:

The study area includes the entire commonwealth of Virginia and a 20-mile buffer around the state. This large buffer was selected to prevent truncation of cores and corridors that cross the state boundary and to facilitate edge matching to similar projects conducted in adjacent states.

The Virginia Department of Conservation and Recreation contracted with the University of Maryland (UMD) to develop a land cover layer for the entire state from Landsat Thematic Mapper satellite imagery. The final product, named RESAC 2000, was derived from imagery dating from 1999 to 2001. RESAC 2000 has 21 classes, nine of which represent natural land covers: Barren, Deciduous Forests, Evergreen Forests, Mixed Forests, Deciduous Wooded Wetlands, Evergreen Wooded Wetlands, Emergent Herbaceous Wetlands, Mixed Wetlands, and Natural Grass. An overall thematic accuracy of 90% was reported for this layer. The resolution of this layer is 30-meters, square.

The RESAC 2000 layer had only a very small buffer around the state, ergo additional imagery was acquired for coverage of the entire study area. Imagery from the Chesapeake Bay Resource Lands Assessment (also developed by UMD), National Land Cover Data (NLCD) 2001, and one piece of NLCD 1992 were merged to RESAC 2000. The NLCD classifications were cross-walked to match RESAC 2000 and all images were projected to Lambert Conformal Conic before merging.

Despite the high reported accuracy of RESAC 2000, there were several important classification errors that needed to be corrected. An accuracy assessment utilizing a five-percent random sample of the Natural Grass class revealed that it almost always represented hayfield or pasture, therefore this class was reclassified to agriculture. There were also maritime grass communities and marshes that were misclassified as agriculture. The marshes were corrected using National Wetlands Inventory (NWI) data, after excluding farmed wetlands, and the maritime grasses were reclassified to a new class of the same name using high-resolution photography to confirm the occurrences were not agriculture. Beaches and dune areas were in the Barren class of RESAC 2000. In order to extract these important natural land covers, undeveloped beaches and dunes were digitized from high-resolution aerial photography dated 2002 (Virginia Base Mapping Program) and the resulting polygons were used to reclassify these areas to a new class named Undeveloped Beaches/Dunes. The resulting layer is known as VANLA Land Cover.

The VANLA Land Cover was used to develop the VANLA cores, which are defined for this analysis as patches of natural cover containing at least 100 acres of interior cover. Interior cover begins 100 meters inward from the patch edge. This 100-meters buffer constitutes the abiotic transition zone following the "three-tree-height" rule (Harris 1984), since fully mature forests in Virginia reach maximum height around 33 meters.

The first step in the core development process was to assemble a fragmentation layer that included spatial data for powerlines, pipelines, railroads, and roads. This layer was used to fragment the VANLA Land Cover, thus making a better approximation of the fragmentation in the landscape. Anthropogenic land covers were excluded from the analysis at this point by extracting from the fragmented land cover layer only the following classes and then classifying them as natural cover: Deciduous Forests, Evergreen Forests, Mixed forests, Deciduous Wooded Wetlands, Evergreen Wooded Wetlands, Emergent Herbaceous Wetlands, Mixed Wetlands, Undeveloped Beaches/Dunes, and Maritime Grasses. One pixel width of near-shore open water was added back from the fragmented land cover to the natural cover layer. This prevented narrow stretches of open water less than 60 meters across (two pixel widths) from splitting a core into two or more smaller patches. The interior areas of the patches in the natural cover layer were identified by using distance analysis to calculate the 100-meter abiotic transition zone of each patch. Interior areas greater than or equal to 10 acres were then identified; all patches not meeting this criterion were excluded from further analysis. The abiotic transition zone was added back to the remaining interior areas. These patches were then classified into Large Cores if they had at least 10,000 acres of interior cover, Medium Cores if they had 1,000 to 9,999 acres of interior cover, Small Cores if they had 100 to 999 acres of interior cover, and Habitat Fragments if they had 10 to 99 acres of interior cover. The Habitat Fragments feature type resulted from a pilot study for the VANLA completed in 2004 (Weber & Carter-Lovejoy) which revealed that the 100-acres minimum interior size for cores was too restrictive for urban and some suburban localities. These features may contain natural heritage resources and have utility for recreation, open space, and storm water management, but they are too small or narrow to provide many of the other benefits of cores.

Analyses were performed to add many prioritization attributes to the cores and habitat fragments layer. Definitions and justifications for each of these prioritization attributes can be found in the attributes section of these metadata.

Process\_Step:

Process\_Description: Dataset copied.

Source\_Used\_Citation\_Abbreviation:

Process\_Step:

Process\_Description: Dataset moved.

Source\_Used\_Citation\_Abbreviation: K:\Laurel's Docs\GIS\GWRC\_VCLNA\LandscapeCorridors\_GWRC\_lam83

Process\_Date: 20090429

Process\_Time: 15184100

Process\_Step:

Process\_Description: Dataset copied.

Source\_Used\_Citation\_Abbreviation: Y:\GWRC\_VCLNA\Models Clipped to GWRC\LandscapeCorridors\_GWRC\_lam83

Process\_Date: 20090814

Process\_Time: 14153700

Spatial\_Data\_Organization\_Information:

Direct\_Spatial\_Reference\_Method: Vector

Geographic\_Coordinate\_Units: Not applicable.

UTM\_Zone\_Number: Not applicable.

SPCS\_Zone\_Identifier: Not applicable.

Altitude\_Datum\_Name: Not Applicable.



Altitude Distance Units: Not Applicable.

Point\_and\_Vector\_Object\_Information:

SDTS\_Terms\_Description:

SDTS\_Point\_and\_Vector\_Object\_Type: G-polygon

Point\_and\_Vector\_Object\_Count: 241

Spatial\_Reference\_Information:

Horizontal\_Coordinate\_System\_Definition:

Planar:

Map\_Projection:

Map\_Projection\_Name: Lambert Conformal Conic

Lambert\_Conformal\_Conic:

Standard\_Parallel: 37.000000

Standard\_Parallel: 39.500000

Longitude\_of\_Central\_Meridian: -79.500000

Latitude\_of\_Projection\_Origin: 36.000000

False\_Easting: 0.000000

False\_Northing: 0.000000

Planar\_Coordinate\_Information:

Planar\_Coordinate\_Encoding\_Method: coordinate pair

Coordinate\_Representation:

Abscissa\_Resolution: 0.000000

Ordinate\_Resolution: 0.000000

Planar\_Distance\_Units: meters

Geodetic\_Model:

Horizontal\_Datum\_Name: North American Datum of 1983

Ellipsoid\_Name: Geodetic Reference System 80

Semi-major\_Axis: 6378137.000000

Denominator\_of\_Flattening\_Ratio: 298.257222

Entity\_and\_Attribute\_Information:

Detailed\_Description:

Entity\_Type:

Entity\_Type\_Label: LandscapeCorridors\_GWRC\_lam83\_Update

Attribute:

Attribute\_Label: FID

Attribute\_Definition: This field contains the Internal Feature Number, a unique sequential number that is automatically generated by ArcGIS 9.1 software.

Attribute\_Definition\_Source: ESRI

Attribute\_Domain\_Values:

Unrepresentable\_Domain: Sequential unique whole numbers that are automatically generated.

Attribute:

Attribute\_Label: Shape

Attribute\_Definition: This field contains the feature geometry, the coordinates defining the features.

Attribute\_Definition\_Source: ESRI

Attribute\_Domain\_Values:

Unrepresentable\_Domain: Coordinates defining the features.

Attribute:

Attribute\_Label: TYPE

Attribute\_Definition: Type of feature -- corridor or node

Attribute:

Attribute\_Label: CORRIDORID

Attribute:

Attribute\_Label: NODEID

Attribute:

Attribute\_Label: COREID

Attribute:

Attribute\_Label: EndCore1

Attribute:

Attribute\_Label: EndCore2

Attribute:

Attribute\_Label: NodeID

Attribute\_Definition: Contains the node ID, which is equal to the core ID.

Attribute:

Attribute\_Label: CorridorID

Attribute\_Definition: Contains a unique identifying number for each corridor

Distribution\_Information:

Resource\_Description: Downloadable Data

Distribution\_Liability: Although all data referred to in this documentation have been used by VADCR, no warranty, expressed or implied, is made by VADCR or the original data sources as to the accuracy of the data. The act of distribution shall not constitute any such warranty, and no responsibility is assumed by VADCR in the use of these data. Users must assume responsibility to determine appropriate use of these data.



VaNLA feature boundaries are not to be used for legal definitions of these areas. Please contact the proper agency or organization with questions concerning ancillary data sets used in, but not created by, the VaNLA. The re-distribution of this dataset for profit is prohibited.

Standard\_Order\_Process:

Digital\_Form:

Digital\_Transfer\_Information:

Transfer\_Size: 1.763

Metadata\_Reference\_Information:

Metadata\_Date: 20090929

Metadata\_Contact:

Contact\_Information:

Contact\_Organization\_Primary:

Contact\_Organization: George Washington Regional Commission

Contact\_Person: Laurel hammig

Contact\_Position: Regional Planner

Contact\_Address:

Address\_Type: 406 Princess Anne Street

City: Fredericksburg

State\_or\_Province: VA

Postal\_Code: REQUIRED: 22041

Contact\_Voice\_Telephone: (540) 373-2890

Contact\_Facsimile\_Telephone: (540) 899-4808

Contact\_Electronic\_Mail\_Address: hammig@gwregion.org

Hours\_of\_Service: 8:00 AM - 4:30 PM

Metadata\_Standard\_Name: FGDC Content Standards for Digital Geospatial Metadata

Metadata\_Standard\_Version: FGDC-STD-001-1998

Metadata\_Time\_Convention: local time

Metadata\_Extensions:

Online\_Linkage: <http://www.esri.com/metadata/esriprof80.html>

Profile\_Name: ESRI Metadata Profile



## Metadata for Ecological Core Update

### Identification\_Information:

#### Citation:

##### Citation\_Information:

Originator: Virginia Department of Conservation and Recreation

Publication\_Date: 20070627

Title: Virginia Natural Landscape Assessment (VaNLA) Ecological Cores

Geospatial\_Data\_Presentation\_Form: vector digital data

##### Publication\_Information:

Publication\_Place: Richmond, Virginia, USA

Publisher: Virginia Department of Conservation and Recreation

Online\_Linkage: [http://www.dcr.virginia.gov/natural\\_heritage/vclna.shtml](http://www.dcr.virginia.gov/natural_heritage/vclna.shtml)

#### Larger\_Work\_Citation:

##### Citation\_Information:

Originator: Virginia Department of Conservation and Recreation

Title: Virginia Conservation Lands Needs Assessment

### Description:

**Abstract:** The Virginia Natural Landscape Assessment (VaNLA), a component of the Virginia Conservation Lands Needs Assessment (VCLNA), is a landscape-scale GIS analysis for identifying, prioritizing, and linking natural habitats in Virginia. Using land cover data derived from satellite imagery, the VaNLA identifies unfragmented natural habitats called Ecological Cores, large patches of natural land cover (mainly upland forests and forested wetlands statewide, but also marshes, beaches, and dunes in the coastal plain) with at least 100 acres of interior conditions. Large, medium, and small Ecological Cores have been identified, along with a smaller feature type called Habitat Fragments that may be important in the more urban localities. Ecological Cores provide habitat for a wide range of species, from those dependent upon interior forests to habitat generalist, as well as species that utilize marsh, dune, and beach habitats. Ecological Cores also provide benefits in terms of open space, recreation, water quality (including drinking water protection), and carbon sequestration, along with the associated economic benefits of these functions. This model was updated based on 100 meter ecological buffers around existing structures. Buffers were removed from the original cores and the core areas were recalculated. If the core lost 20% or more area, it was recategorized as having lower ecological value.

**Purpose:** The VaNLA generates fundamental ecological data layers for conservation of land and natural resources in Virginia.

**Supplemental\_Information:** The ecological cores model updated based on latest building files from localities.

### Time\_Period\_of\_Content:

#### Time\_Period\_Information:

##### Single\_Date/Time:

Calendar\_Date: circa 2007

**Currentness\_Reference:** RESAC 2000 Land Cover and latest building files from all localities

### Status:

**Progress:** Complete

**Maintenance\_and\_Update\_Frequency:** As needed

### Spatial\_Domain:

#### Bounding\_Coordinates:

West\_Bounding\_Coordinate: -77.639741

East\_Bounding\_Coordinate: -77.291490

North\_Bounding\_Coordinate: 38.594844

South\_Bounding\_Coordinate: 38.241112

### Keywords:

#### Theme:

Theme\_Keyword\_Thesaurus: none

Theme\_Keyword: Virginia Natural Landscape Assessment

Theme\_Keyword: VaNLA

Theme\_Keyword: Natural Land Network

Theme\_Keyword: Green Infrastructure

#### Place:

Place\_Keyword\_Thesaurus: none

Place\_Keyword: Virginia

Place\_Keyword: Mid-Atlantic

### Temporal:

Temporal\_Keyword\_Thesaurus: None

Temporal\_Keyword: 2009

### Access\_Constraints:

Access\_Constraints: none

### Use\_Constraints:

Use\_Constraints: none

**Completeness\_Report:** Data are as complete as the source at the time of publication.

### Positional\_Accuracy:

#### Horizontal\_Positional\_Accuracy:

Horizontal\_Positional\_Accuracy\_Report: As accurate as the source data.

#### Vertical\_Positional\_Accuracy:

Vertical\_Positional\_Accuracy\_Report: As accurate as the source data.

**Source\_Scale\_Denominator:** 0

### Point\_of\_Contact:

#### Contact\_Information:

Contact\_Person\_Primary:  
Contact\_Person: Laurel Hammig  
Contact\_Organization: George Washington Regional Commission  
Contact\_Position: Regional Planner  
Contact\_Address:  
Address: 406 Princess Anne Street  
City: Fredericksburg  
State\_or\_Province: Virginia  
Postal\_Code: 22401  
Country: USA  
Contact\_Voice\_Telephone: (540) 373-2890  
Contact\_Facsimile\_Telephone: (804) 899-4808  
Contact\_Electronic\_Mail\_Address: hammig@gwregion.org  
Hours\_of\_Service: 8:00 AM - 4:30 PM

Native\_Data\_Set\_Environment: Microsoft Windows XP Version 5.1 (Build 2600) Service Pack 3; ESRI ArcCatalog 9.3.0.1770

Data\_Quality\_Information:

Lineage:

Process\_Step:

Process\_Description:

The study area includes the entire commonwealth of Virginia and a 20-mile buffer around the state. This large buffer was selected to prevent truncation of cores and corridors that cross the state boundary and to facilitate edge matching to similar projects conducted in adjacent states.

The Virginia Department of Conservation and Recreation contracted with the University of Maryland (UMD) to develop a land cover layer for the entire state from Landsat Thematic Mapper satellite imagery. The final product, named RESAC 2000, was derived from imagery dating from 1999 to 2001. RESAC 2000 has 21 classes, nine of which represent natural land covers: Barren, Deciduous Forests, Evergreen Forests, Mixed Forests, Deciduous Wooded Wetlands, Evergreen Wooded Wetlands, Emergent Herbaceous Wetlands, Mixed Wetlands, and Natural Grass. An overall thematic accuracy of 90% was reported for this layer. The resolution of this layer is 30-meters, square.

The RESAC 2000 layer had only a very small buffer around the state, ergo additional imagery was acquired for coverage of the entire study area. Imagery from the Chesapeake Bay Resource Lands Assessment (also developed by UMD), National Land Cover Data (NLCD) 2001, and one piece of NLCD 1992 were merged to RESAC 2000. The NLCD classifications were cross-walked to match RESAC 2000 and all images were projected to Lambert Conformal Conic before merging.

Despite the high reported accuracy of RESAC 2000, there were several important classification errors that needed to be corrected. An accuracy assessment utilizing a five-percent random sample of the Natural Grass class revealed that it almost always represented hayfield or pasture, therefore this class was reclassified to agriculture. There were also maritime grass communities and marshes that were misclassified as agriculture. The marshes were corrected using National Wetlands Inventory (NWI) data, after excluding farmed wetlands, and the maritime grasses were reclassified to a new class of the same name using high-resolution photography to confirm the occurrences were not agriculture. Beaches and dune areas were in the Barren class of RESAC 2000. In order to extract these important natural land covers, undeveloped beaches and dunes were digitized from high-resolution aerial photography dated 2002 (Virginia Base Mapping Program) and the resulting polygons were used to reclassify these areas to a new class named Undeveloped Beaches/Dunes. The resulting layer is known as VANLA Land Cover.

The VANLA Land Cover was used to develop the VANLA cores, which are defined for this analysis as patches of natural cover containing at least 100 acres of interior cover. Interior cover begins 100 meters inward from the patch edge. This 100-meters buffer constitutes the abiotic transition zone following the "three-tree-height" rule (Harris 1984), since fully mature forests in Virginia reach maximum height around 33 meters.

The first step in the core development process was to assemble a fragmentation layer that included spatial data for powerlines, pipelines, railroads, and roads. This layer was used to fragment the VANLA Land Cover, thus making a better approximation of the fragmentation in the landscape. Anthropogenic land covers were excluded from the analysis at this point by extracting from the fragmented land cover layer only the following classes and then classifying them as natural cover: Deciduous Forests, Evergreen Forests, Mixed forests, Deciduous Wooded Wetlands, Evergreen Wooded Wetlands, Emergent Herbaceous Wetlands, Mixed Wetlands, Undeveloped Beaches/Dunes, and Maritime Grasses. One pixel width of near-shore open water was added back from the fragmented land cover to the natural cover layer. This prevented narrow stretches of open water less than 60 meters across (two pixel widths) from splitting a core into two or more smaller patches. The interior areas of the patches in the natural cover layer were identified by using distance analysis to calculate the 100-meter abiotic transition zone of each patch. Interior areas greater than or equal to 10 acres were then identified; all patches not meeting this criterion were excluded from further analysis. The abiotic transition zone was added back to the remaining interior areas. These patches were then classified into Large Cores if they had at least 10,000 acres of interior cover, Medium Cores if they had 1,000 to 9,999 acres of interior cover, Small Cores if they had 100 to 999 acres of interior cover, and Habitat Fragments if they had 10 to 99 acres of interior cover. The Habitat Fragments feature type resulted from a pilot study for the VANLA completed in 2004 (Weber & Carter-Lovejoy) which revealed that the 100-acres minimum interior size for cores was too restrictive for urban and some suburban localities. These features may contain natural heritage resources and have utility for recreation, open space, and storm water management, but they are too small or narrow to provide many of the other benefits of cores.

Analyses were performed to add many prioritization attributes to the cores and habitat fragments layer. Definitions and justifications for each of these prioritization attributes can be found in the attributes section of this metadata document or in the metadata for the additional attributes table.

Process\_Date: 20070509

Spatial\_Data\_Organization\_Information:



Direct\_Spatial\_Reference\_Method: Vector  
 Point\_and\_Vector\_Object\_Information:  
   SDTS\_Terms\_Description:  
     SDTS\_Point\_and\_Vector\_Object\_Type: G-polygon  
     Point\_and\_Vector\_Object\_Count: 470  
 Geographic\_Coordinate\_Units: Not applicable.  
 UTM\_Zone\_Number: Not applicable.  
 SPCS\_Zone\_Identifier: 4501  
 Altitude\_Datum\_Name: NAD83  
 Altitude\_Distance\_Units: Feet  
 Spatial\_Reference\_Information:  
   Horizontal\_Coordinate\_System\_Definition:  
     Planar:  
       Map\_Projection:  
         Map\_Projection\_Name: Lambert Conformal Conic  
         Lambert\_Conformal\_Conic:  
           Standard\_Parallel: 37.000000  
           Standard\_Parallel: 39.500000  
           Longitude\_of\_Central\_Meridian: -79.500000  
           Latitude\_of\_Projection\_Origin: 36.000000  
           False\_Easting: 0.000000  
           False\_Northing: 0.000000  
         Planar\_Coordinate\_Information:  
           Planar\_Coordinate\_Encoding\_Method: coordinate pair  
           Coordinate\_Representation:  
             Abscissa\_Resolution: 0.000000  
             Ordinate\_Resolution: 0.000000  
           Planar\_Distance\_Units: meters  
       Geodetic\_Model:  
         Horizontal\_Datum\_Name: North American Datum of 1983  
         Ellipsoid\_Name: Geodetic Reference System 80  
         Semi-major\_Axis: 6378137.000000  
         Denominator\_of\_Flattening\_Ratio: 298.257222  
     Entity\_and\_Attribute\_Information:  
       Detailed\_Description:  
         Entity\_Type:  
           Entity\_Type\_Label: CoresandDissolve\_Union  
         Attribute:  
           Attribute\_Label: FID  
           Attribute\_Definition: This field contains the Internal Feature Number, a unique sequential number that is automatically generated by ArcGIS 9.1 software.  
           Attribute\_Definition\_Source: ESRI  
           Attribute\_Domain\_Values:  
             Unrepresentable\_Domain: Sequential unique whole numbers that are automatically generated.  
         Attribute:  
           Attribute\_Label: Shape  
           Attribute\_Definition: This field contains the feature geometry, the coordinates defining the features.  
           Attribute\_Definition\_Source: ESRI  
           Attribute\_Domain\_Values:  
             Unrepresentable\_Domain: Coordinates defining the features.  
         Attribute:  
           Attribute\_Label: FID\_Eco\_Co  
         Attribute:  
           Attribute\_Label: COREID  
           Attribute\_Definition: This field contains a unique numeric identifier for each VANLA Core or Habitat Fragment.  
           Attribute\_Definition\_Source: JTW  
         Attribute:  
           Attribute\_Label: TYPE  
           Attribute\_Definition: This field identifies the type of VANLA feature.  
           Attribute\_Definition\_Source: JTW  
           Attribute\_Domain\_Values:  
             Enumerated\_Domain:  
               Enumerated\_Domain\_Value: LC  
               Enumerated\_Domain\_Value\_Definition: Large Core: a core area with at least 10,000 acres of interior cover  
             Enumerated\_Domain:  
               Enumerated\_Domain\_Value: MC  
               Enumerated\_Domain\_Value\_Definition: Medium Core: a core area with 1,000 - 9,999 acres of interior cover  
             Enumerated\_Domain:  
               Enumerated\_Domain\_Value: SC

Enumerated\_Domain\_Value\_Definition: Small Core: a core area with 100 to 999 acres of interior cover

Enumerated\_Domain:

Enumerated\_Domain\_Value: HF

Enumerated\_Domain\_Value\_Definition: Habitat Fragment: a patch of natural land cover with 10 to 99 acres of interior cover

Attribute:

Attribute\_Label: EO\_COUNT

Attribute\_Definition: This field contains the number of Natural Heritage Element Occurrences per VANLA Core or Habitat Fragment. These occurrences exclude records without dates, with dates prior to 1981, or with poor spatial precision (minutes or general precision).

Attribute\_Definition\_Source: JTW

Attribute:

Attribute\_Label: TIER1EHACR

Attribute\_Definition: This field contains the acreage of potential and confirmed habitats for Tier 1 species, the species of greatest conservation need in Virginia, per VANLA Core or Habitat Fragment. The source of these data is the Virginia Wildlife Action Plan that was developed by the Virginia Department of Game and Inland Fisheries.

Attribute\_Definition\_Source: JTW

Attribute:

Attribute\_Label: SRMAX

Attribute\_Definition: This field contains the maximum value of potential species richness values of vertebrates and lepidopterans per VANLA Core or Habitat Fragment based of potential distribution maps developed by the Virginia GAP.

Attribute\_Definition\_Source: JTW

Attribute:

Attribute\_Label: TOTALACRES

Attribute\_Definition: This field contains the total acreage of each VANLA Core or Habitat Fragment.

Attribute\_Definition\_Source: JTW

Attribute:

Attribute\_Label: DEPTHINTER

Attribute\_Definition: This field contains the depth of interior of each VANLA Core or Habitat Fragment. This value represents the maximum distance (meters) from all edges that can be achieved within a core or habitat fragment. This parameter is useful for selecting and modeling cores that provide more protection for interior species.

Attribute\_Definition\_Source: JTW

Attribute:

Attribute\_Label: THREAT

Attribute\_Definition: This field indicates the threat if not conserved of each VANLA Core or Habitat Fragment. The values indicate the potential land use change from the current use to an urban or suburban use. Values range from 1, lowest potential of conversion, to 8, greatest potential of conversion. The source of these data is the Virginia Vulnerability Model, VCLNA.

Attribute\_Definition\_Source: JTW

Attribute:

Attribute\_Label: DRINKACRE

Attribute\_Definition: This field contains the acreage of high priority groundwater and surface water protection zones per VANLA Core or Habitat Fragment. The source of these data is the Virginia Department of Health Office of Drinking Water.

Attribute\_Definition\_Source: JTW

Attribute:

Attribute\_Label: UMNWIACRES

Attribute\_Definition: This field contains the acreage of unmodified wetlands per VANLA Core or Habitat Fragment. Unmodified wetlands are based on National Wetlands Inventory data from which farmed, diked, ditched, and otherwise modified wetlands were removed. Beaver impoundments, which are a natural form of modification, were left in the unmodified wetlands layer.

Attribute\_Definition\_Source: JTW

Attribute:

Attribute\_Label: UMNWIPERC

Attribute\_Definition: This field contains the percent area of unmodified wetlands per VANLA Core or Habitat Fragment. Unmodified wetlands are based on National Wetlands Inventory data from which farmed, diked, ditched, and otherwise modified wetlands were removed. Beaver impoundments, which are a natural form of modification, were left in the unmodified wetlands layer.

Attribute\_Definition\_Source: JTW

Attribute:

Attribute\_Label: PercConsVa

Attribute\_Definition: This field contains the percentage of each core or habitat fragment that is already conserved according to DCR's Conservation Lands Database (as of 21 August 2006).

Attribute\_Definition\_Source: JTW

Attribute:

Attribute\_Label: SitesIndex

Attribute\_Definition: This field contains the Conservation Sites Index, which resulted from summing the products of B-rank factors and B-rank weights. The B-rank factors resulted from dividing conservation site and core intersections by the total area of intersecting conservation sites with the same B-rank. The weights were 50, 40, 30, 20, and 10 for B1, B2, B3, B4, and B5 ranked conservation sites, respectively.

Attribute\_Definition\_Source: JTW

Attribute:

Attribute\_Label: SCUIndex

Attribute\_Definition: This field contains the Stream Conservation Units (SCU) and Threatened and Endangered (T&E) Waters Index, which resulted from summing the products of B-rank factors and B-rank weights. The T&E Waters were buffered to the same width (5 meters) as SCUs and assigned B-ranks before they were merged with the SCUs. The B-rank factors resulted from dividing intersections of the T&E-SCU



features and cores by the total area of intersecting T&E-SCU features with the same B-rank. The weights were 50, 40, 30, 20, and 10 for B1, B2, B3, B4, and B5 ranked T&E-SCU features, respectively. The T&E Waters layer was developed by Virginia Department of Game and Inland Fisheries.

Attribute\_Definition\_Source: JTW

Attribute:

Attribute\_Label: ECM

Attribute\_Definition: This field contains scores from the Ecological Composite Model used to assess ecological integrity. Definition of Ecological Integrity: Maintaining vital natural landscapes is essential for basic ecosystem services such as cleaning our air and filtering our water. Natural lands also harbor thousands of species of animals and plants and contain libraries of genetic information from which we derive new foods, materials, and medicinal compounds. These parts of the landscape also provide us with recreational opportunities and open space resources. But these qualities are represented differently across the cores and habitat fragments that constitute the natural landscape. To assess their unique values, each core and habitat fragment has been assigned an ECOLOGICAL INTEGRITY score that rates the relative contribution of that area to the ecosystem service values above. In general, larger, more biologically diverse areas are given higher scores. Scores are enhanced if the core or habitat fragment is part of a larger complex of natural lands. Scores also are increased for those cores and habitat fragments that contribute to water quality enhancement.

Attribute\_Definition\_Source: Review Team

Attribute:

Attribute\_Label: EI\_Class

Attribute\_Definition: This field represents the ecological integrity scores from the ECM summarized in 5 classes.

Attribute\_Definition\_Source: JTW

Attribute\_Domain\_Values:

Enumerated\_Domain:

Enumerated\_Domain\_Value: 1

Enumerated\_Domain\_Value\_Definition: Outstanding

Enumerated\_Domain:

Enumerated\_Domain\_Value: 2

Enumerated\_Domain\_Value\_Definition: Very High

Enumerated\_Domain:

Enumerated\_Domain\_Value: 3

Enumerated\_Domain\_Value\_Definition: High

Enumerated\_Domain:

Enumerated\_Domain\_Value: 4

Enumerated\_Domain\_Value\_Definition: Moderate

Enumerated\_Domain:

Enumerated\_Domain\_Value: 5

Enumerated\_Domain\_Value\_Definition: General

Attribute:

Attribute\_Label: FID\_Bldgs\_

Attribute:

Attribute\_Label: ID

Attribute:

Attribute\_Label: AREA

Attribute:

Attribute\_Label: WIDTH

Attribute:

Attribute\_Label: Extra

Attribute:

Attribute\_Label: Perimeter

Attribute:

Attribute\_Label: Acres

Attribute:

Attribute\_Label: Percent\_Ch

Attribute:

Attribute\_Label: New\_EI\_CI

Attribute:

Attribute\_Label: Change

Distribution\_Information:

Distributor:

Contact\_Information:

Contact\_Person\_Primary:

Contact\_Person: Laurel Hammig

Contact\_Organization: George Washington Regional Commission

Contact\_Position: Regional Planner

Contact\_Address:

Address: 406 Princess Anne Street

City: Fredericksburg

State\_or\_Province: Virginia

Postal\_Code: 22401

Country: USA

Contact\_Voice\_Telephone: (540) 373-2890  
 Contact\_Facsimile\_Telephone: (540) 899-4808  
 Contact\_Electronic\_Mail\_Address: hammig@gwregion.org  
 Hours\_of\_Service: 8:00 AM - 4:30 PM  
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 Standard\_Order\_Process:  
   Digital\_Form:  
     Digital\_Transfer\_Information:  
       Format\_Name: ESRI Shapefile  
       Transfer\_Size: 1.196  
     Digital\_Transfer\_Option:  
       Online\_Option:  
         Computer\_Contact\_Information:  
           Network\_Address:  
 Technical\_Prerequisites: End user must have GIS software capable of importing and displaying ESRI shapefiles.  
 Metadata\_Reference\_Information:  
   Metadata\_Date: 20090930  
   Metadata\_Contact:  
     Contact\_Information:  
       Contact\_Organization\_Primary:  
         Contact\_Organization: George Washington Regional Commission  
         Contact\_Person: Laurel Hammig  
         Contact\_Position: Regional Planner  
       Contact\_Address:  
         Address: 406 Princess Anne Street  
         City: Fredericksburg  
         State\_or\_Province: Virginia  
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         Country: USA  
       Contact\_Voice\_Telephone: (540) 373-2890  
       Contact\_Facsimile\_Telephone: (540) 899-4808  
       Contact\_Electronic\_Mail\_Address: hammig@gwregion.org  
       Hours\_of\_Service: 8:00 AM - 4:30 PM  
   Metadata\_Standard\_Name: FGDC Content Standards for Digital Geospatial Metadata  
   Metadata\_Standard\_Version: FGDC-STD-001-1998  
   Metadata\_Time\_Convention: local time  
   Metadata\_Extensions:  
     Online\_Linkage: <http://www.esri.com/metadata/esriprof80.html>  
     Profile\_Name: ESRI Metadata Profile